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A SEASONAL CHECK LIST

Teachers who are active in boys' camps during the summer months may be interested in the many helpful plates that W. Ben. Hunt, instructor of handcraft for boy scouts has prepared for INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. These have been appearing in this Magazine since May, 1935. Many of them are ideally suited to keep camp boys interested and occupied. A list of those that have appeared to date follows: 1935 — Hopi Tihus Dolls, May; Indian Peace Pipes, October; Pack Rack, November; Indian Tom-Tom, December; 1936 — Camp Knife, January; Indian Beadwork, March; How to Make Rawhide, March; Indian Gourd Rattles, April; Indian War Clubs, May; Indian Moccasins, June; Indian Necklaces, August; Indian Symbols and Designs, September; Indian Snowshoes of Wood, October; Totem Pole, December; 1937 — Indian Tepee, January; Neckerchief Slides, February; Alaskan Eskimo Snowshoes, April; Hollow Log Bird Houses, May; Indian Wigwam, May.

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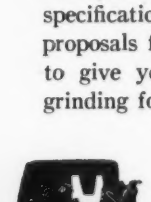

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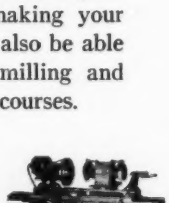

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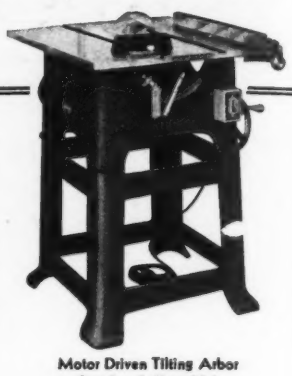

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INDUSTRIAL ARTS and VOCATIONAL EDUCATION

June, 1937
Vol. 26, No. 6

The Scientific Method and Historical Research—I

L. F. Ashley
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Eastern Illinois State Teachers College, Charleston, Illinois

This is the first of a series of four articles on industrial-arts research.

As the industrial-arts teacher looks into philosophy for more worth-while bases and methods, and into content for more valid materials, he is confronted at every turn with the need for understanding research procedures. The graduate student is further concerned with the problem of what in the industrial-arts field needs investigating.

The following condensed statement of the procedures in a historical research will serve as a guide to the beginner until such time as the order may become fixed for him. However, should one do much work in this field, he will want more familiarity with details than this treatise can attempt. In this case, it will be well for him to become acquainted with several authorities to whom this paper will introduce him.

It is well to mention at the outset, that authors who are familiar with the German or French language, will find Ernest Bernheim's book, *Lehrbuch der Historischen Methode,* to be an outstanding reference, while the best condensed work on historical method is the book, *Introduction aux Etudes Historiques,* by C. V. Langlois and C. Seignobos. The former has not been translated, but good translations exist of the latter. Harry G. Good of the department of education at the Ohio State University, himself a writer and an authority on historical research, recommends several noteworthy writers as guides for the beginner. These are referred to frequently in this paper.

What is historical method? What are the sources? Who are the authorities, and what have they said about method? These are questions arising in one's mind when he is introduced to the subject, the answer to which will determine his future interest.

Turning at once to authorities for clues, Vincent, in his *Historical Research,* suggests that *development* is the keynote of history:

"The thread upon which the story of any nation hangs is development from past to present."

Fling, in *The Writing of History,* furnishes these statements as to the nature of history:

"History is dynamic; it deals with mankind in action and its purpose is to trace the unique changes which are the results of these activities. . . . Any synthesis that does not make clear these three things, (1) the original condition, (2) the action, and (3) the novelty in the resulting conditions fails to meet the legitimate demands of historical research."

Thus it appears that the ideas in *history* and in *research* are practically synonymous, though either may not necessarily be the other. History which is not based upon original sources will not contain much, if anything, which can be called research, and research may deal with other things than history. According to Schluter:

"Research is the endeavor to discover, to develop, and to verify knowledge. Latent and universified knowledge being the objective of a quest or inquiry must then be conceived in terms of problems. Research is therefore directed toward the discovery of problems and consists of the methods upon which the solutions of these problems are predicted."

Assuming that one is qualified by background and training to undertake a particular study, one's first problem is the *choice of a subject.* Fling offers these criteria regarding the selection and naming of a problem:

"(1) To limit the scope of the investigation so that the work may be thoroughly done in the time that may be given to it and (2) to select a topic that is a part of a larger whole, making possible an indefinite continuation of research."

He elaborates the latter suggestion with the statements that a beginner may choose the whole of a topic without realizing that it might take years to investigate. If he takes an isolated part there is danger that his investigations may end with his master's or doctor's thesis. Further guidance in the selection of the topic is offered in the following:

"(1) Has it ever been investigated? (2) Has it been investigated in an incomplete way? (3) Has the material been treated uncritically? (4) Is a new and valuable synthesis possible? (5) Has new material been found that justifies re-examination of the topic?"

When the topic for investigation has been decided upon, it may be set down on paper in a comprehensive paragraph. The exact wording for a title to the monograph may be left to the last, for it will need to be worked over very carefully to make it as concise and yet as indicative of the content as possible.

An example is the title of this paper in which one gathers the central theme of the development. The next step is to *discover the evidence* bearing on the topic, the importance of which Fling sets forth as follows:

"A thorough search for sources, a serious attempt to bring together all the evidence bearing upon the topic is the *sine qua non* of a piece of investigation that is to have any permanent value."

The first move in the search for sources should be to compile a bibliography. Good says that:

"Almost every question in history is at the start a question of bibliography."

The steps involved in securing evidence are summed up by him somewhat as follows: "The student must have a supply of 3 by 5 in. or 4 by 6 in. cards or loose sheets of uniform size to use for *note taking.*[1] He must then examine the card catalog of a large library and select the names of recent books on the subject. They are most likely to contain the best bibliog-

[1]The following is recommended for a more comprehensive account of this procedure: Deow, Earl W., *Principles of a Note System for Historical Studies,* New York, Century Co., 1924, 124 pages.

raphies from which original sources can be selected. Reviews should generally be avoided as they are for the most part unreliable sources. Available texts should be examined; when such are pertinent to the subject. Their significance can scarcely be overemphasized for data on education, and are cited as ". . . the most valuable of all educational remains."

Documents should be looked over and their places in the library noted for further reference. They are classed as follows:

I. Legal acts as constitutions, laws, charters.
II. Court decisions.
III. Executive and other official records.
IV. Newspapers and periodicals.
V. Personal materials.
VI. Literary materials.

The nature of these divisions of documentary historical materials is almost conspicuous in the naming of them. Old constitutions, charters, and laws tell many things of the mores of peoples and their times. The same may be said of court decisions. Many laws which we look at now as peculiar tell certain things about the beliefs and customs of the people living at various periods. Old newspapers and periodicals which may be found in state libraries and the Library of Congress tell much by their classified advertising. One finds mention of schools from which much can be gleaned regarding education. Notions of public and private property can be gathered that would be difficult to find in other sources. Personal materials such as rings and other jewelry, letters, and diaries are often valuable sources of historical evidence. Literary materials frequently contain much regarding ideas, customs, and beliefs.

Vincent speaks of documents in a group heading, in which he includes inscriptions and monuments as one of three in the major lists of historical materials. The other two are:

1. Consciously transmitted information which he lists as written, oral, and artistic productions. Under "written" are chronicles, annuals, biographies, memoirs, diaries, genealogies, and certain classes of inscriptions. Under "oral" are ballads, anecdotes, tales, and sages. Under "artistic productions" are historical paintings, portraits, scenic sculpture, and coin types.

2. Relics or unconscious testimony he explains as: Human remains, language, institutions, products of the hands, implements, fine arts, products of the mind, business records, and literature.

The taking of notes should proceed so that the final recording will be as greatly facilitated as possible. Headings should be written in the upper left-hand corners. The names and pages of the sources should be noted. Citations or quotations should be made briefly, using abbreviations. The cards should be grouped in the order in which they will be used. They may be arranged so that the subject matter is in chronological order, or so that like subject matter falls together, depending upon the nature of the topic. The cards are then indexed and placed in a box or file for safety. They should be in alphabetical order to facilitate the compilation of the material on them.

When the student has gathered all the data possible that seems to bear on the subject, his next step is to determine what of that which he has is really evidence. This process is called *External Criticism*, according to Good:

"It deals only occasionally with forgery but constantly with authorship, time, and the filiation of documents, that is, with their dependence upon each other, with interpolation and borrowing."

The writer who does not cite his authority cannot be trusted for satisfactory evidence, unless he has a wide reputation for truth seeking. According to Crump (2, 11), in historical research:

"The first rule is that the evidence for all conclusions must be stated as it exists in the same source from which it is taken, avoiding any method of statement that may alter or impair its meaning or its emphasis. The second rule is that the writer must distinguish clearly between the evidence and any criticisms or inferences made by himself."

These rules apply to the writer of a historical research, as well as to the authors of his source material. An example of a writer of history in the field of industrial arts who has been very careful regarding his sources, even to the extent of furnishing photographic copies of his citations, is Charles A. Bennett, in his *History of Manual and Industrial Education up to 1870*.

Even though one has been as careful to furnish the sources as was Professor Bennett, they still may not be evidence. George says in this connection in his book on *Historical Evidence:*

"When we say that a given statement is evidence, what do we mean? Simply that on assumption that it is true, an inference is drawn: it only becomes evidence if, and so far as, it is used as the basis for an inference. . . .

"Testimony depends on three things — the opportunity which the witness has had of knowing the truth, his capacity for accurate observation, and his honesty of intention."

To be sure of the evidence, the material written needs to be scanned for interpolations, extraneous material, and for the validity of statements which remain when the spurious matter has been removed. The language of the writer must be determined. This process of examining the actual text material is called by writers of historical method *internal criticism*.

Since history is not based upon experiment but rather upon the evolution of facts, one will recognize the importance of sifting his bibliographical material with the utmost care. However, it should not be considered closed after the shifting process, but should be open for expansion as the monograph develops, because of new materials which may become available, though the student may now begin to set forth his findings.

The process of writing down the results of the research is known as *historical composition*. Hockett in his *Introduction to Research in American History*, gives the following outline of general procedure with the monograph:

A. A Working Outline Should Be Made
B. The Preliminary Draft Should Be Written
   1. Attention Should Be Given to Approved Usage of:
      a) Footnotes
      b) Abbreviations
      c) Indentations
      d) Punctuation
   2. Attention Should Be Given to Literary Style and Finish
C. The Final Revision Should Follow

The working outline is always tentative, that is, subject to revision as the development proceeds, yet it remains a guide which helps to keep the facts co-ordinate. Its inadequateness becomes apparent as the solution of the problem evolves.

There are numerous books on style (see footnote) which should be at hand as the writing proceeds. Many of the books on historical research already mentioned have chapters devoted to it. Vincent shows that there are many problems other than the order of standard form and usage in this consideration. There is the question ever present, yet on which writers do not agree: Shall the composition be purely scientific in its aspect or shall it be literary with the idea of entertainment in it? What does the reader think? There is the danger for the overenthusiastic worker of setting down more than is necessary in developing the problem. Regarding this, Vincent says:

"The investigator runs some peril of getting fixed notions of characters with whom he comes much in contact and must beware lest his research become a brief in defense of persons instead of a judicial opinion of facts. . . .

"Biographers are particularly liable to distort the perspective of their works by exaggerating the importance of their chosen character. Long study of one personality seems to lead naturally to that result. The biographer being better informed than his readers, must know many more details about his subject and will undoubtedly see more fine points in his character, but at the same time he must beware lest he succumb to the subtle temptation to magnify the value of his own task."

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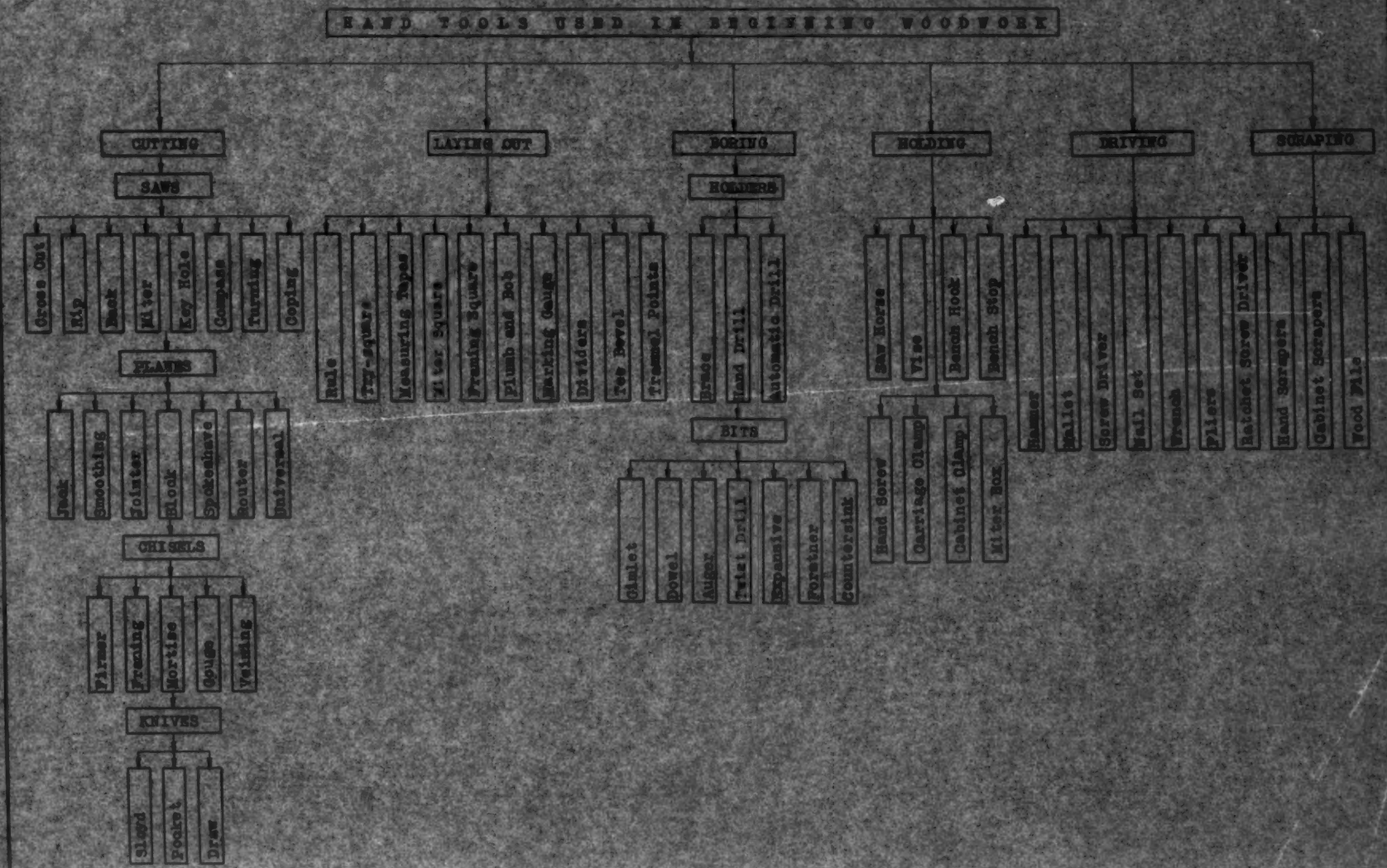

Submitted by George C. Decker, State Teachers College, Buffalo, New York

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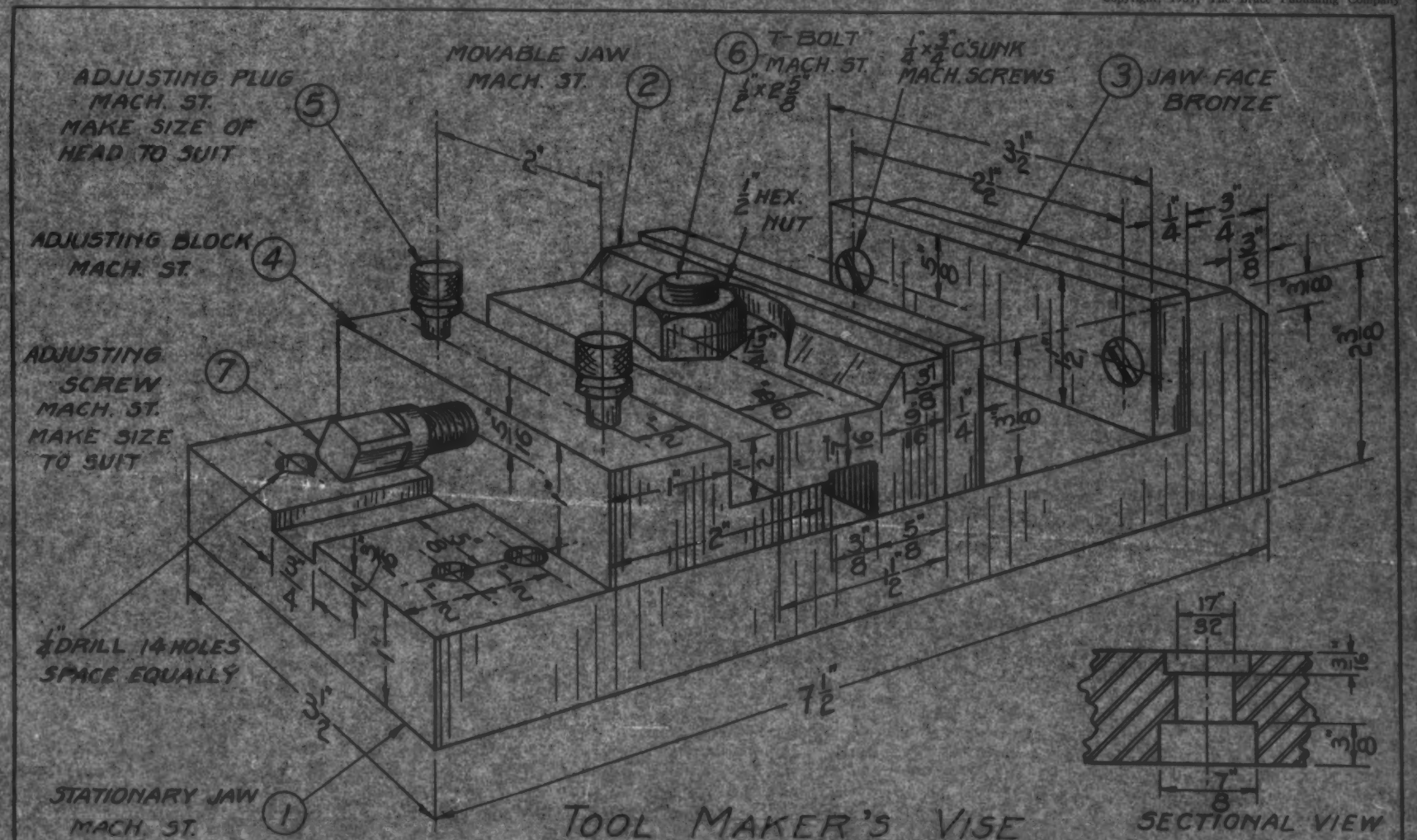

TOOL MAKER'S VISE

MAKE DETAIL DRAWINGS OF ALL NUMBERED PARTS. FROM THE DETAILS MAKE AN ASSEMBLY DRAWING.

SECTIONAL VIEW SHOWING T-BOLT SLOT IN BASE

Submitted by W. A. DeVette, Wilson Junior High School, Erie, Pennsylvania. (Described elsewhere in this issue)

UNIV. OF MICH.

Historical composition requires that facts be stated briefly and simply, but with smoothness. It requires much reworking to satisfy these criteria. Sentences need to be rearranged or deleted so that there is transition from one group of facts to the next. These reworkings help to coordinate the thought, which the writer often finds in his revising to be out of place or unnecessary. The final draft should be mechanically artistic in appearance and development.

Historical research connotates development. Kelley, in his *Scientific Method,* speaks of research as evolving: "The essence of research is evolution." Here is the common ground between scientific and historical research, though the former deals with or may be based upon experiments, while the latter is based upon existing facts. The scientific method evolves according to Dewey in *How We Think* with:

"1. A felt difficulty,

"2. A definite or specific location of the issue,

"3. A tentative mental solution,

"4. A mental elaboration of this tentative mental solution to see if it is thoroughly sound, resulting perhaps in its discardance, and the adoption of a second tentative solution — the process is continued until a solution is obtained which mentally seems adequate,

"5. This is then tried out in actuality, and if it succeeds it is accepted as the solution of the problem."

The process of historical research, then consists of (1) the selection of the problem, such as the student believes he can solve; (2) the gathering of data by means of a system of note-taking and including a complete bibliography; (3) sifting of the data gathered by external and internal criticism; (4) writing of the exposition so that it conforms with approved standards of form and research; (5) adding of a bibliography; (6) adding an index. The whole routine is a natural one, and the reader interested in any of problem solving, will find it an undertaking of historical research, pleasure and profit.

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1. Bennett, Charles A., *The History of Manual and Industrial Education up to 1870,* Peoria, Ill. The Manual Arts Press, 1926, 461 pages.

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7. Kelley, Truman Lee, *Scientific Methods,* Columbus, Ohio. State University Press, 1929, 190 pages.

8. Nevins, Allan, *Master's Essays in History,* New York. Columbia University Press, 1930, 24 pages.

9. Schluter, W. C., *How to Do Research Work,* New York. Prentice-Hall, 1929, 137 pages.

10. Vincent, John Martin, *Historical Research: An Outline in Theory and Practice,* New York. Peter Smith by permission of Henry Holt, 1929, 350 pages.

NOTE: A different method of citing references will be used in succeeding articles on Industrial-Arts Research in order to show the reader another preferred style.

Educational Tests and Measurements

George J. Mann

Haldane Central School,
Cold Spring, New York

Measuring the effects of teaching and learning has long been attempted on a subjective basis.[1] The teacher has said that a child succeeded or that he failed; that he made his grade or that he did not make it; that the quality of his failing work was very poor, poor, or just passing; that his passing work was just above passing, fair, good, or excellent.

As early as 1845, according to S. E. Courtis, a committee attempted to measure the efficiency of the Boston schools, and Horace Mann, in his comments upon the report, prophesied that the future would see tests scientifically prepared, given, scored, and tabulated. Conditions were not favorable to the spread of the measurement movement anticipated by Horace Mann, and there is no evidence for many years afterward, that educators gave serious consideration to the development of the measurement movement.

Educational measurement is based upon certain assumptions, some of which may be stated as principles, others as workable theories.

1. *Whatever exists at all, exists in some amount.* The amount may be measured by quality, quantity, or both. The measurement made is of the product and of the change as a reflection of the inner condition of the individual measured. This must not be construed to mean that instruments are available to perform all measuring functions. There is a wide field of endeavor still open for perfecting these measuring instruments.

2. *Scientific measurement in education is closely related to educational progress.* The thermometer is one of the measuring devices that make medicine effective. In the same manner, the effectiveness upon the part of the industrial-arts teacher in the teaching of certain skills is dependent upon his ability to measure the amount of skill the pupils have before and after a given presentation. All the methods of measurement should not be confined to tests, as these represent only one of the measures now being developed to further the cause of education. Nevertheless, just because some of the methods of measurement in certain phases of educational achievement are crude, is no excuse for not using them. Progress is made slowly, by experimentation.

The bibliography in this article may be very helpful to those interested in tests and measurements.

3. *Scientific measurement in education is conditioned by the objectives of education as a whole, and of the school subjects specifically.* The objectives of education whose selection is influenced by the social-utility point of view in education, would not justify the inclusion in our industrial-arts auto mechanics (general shop) of such an item as rebabbiting connecting rods. It would, then, be foolish to include in a standardized industrial-arts test in auto mechanics the assignment of rebabbiting connecting rods. (The author calls your attention to the fact that he is talking about industrial-arts auto mechanics and not vocational auto mechanics.)

4. *Educational measurement is justified only by the resulting improvement in the learning on the part of the child.* Measurement for measurement's sake, has no place in the ordinary school system. Testing and then merely filing away the results, without following them up, is the greatest

[1] *Tests and Measurements,* H. L. Smith and W. W. Wright. Silver, Burdett and Co., New York City. Introduction.

sin perpetrated by those interested in the measurement. Correct interpretation of results and the remedial administration, supervision, or teaching that will follow, which will aid the child to learn more effectively, are the real values in testing.

School marks have come to play an important and integral part of our educational setup. At this point, it might be well to consider their purpose.

1. Administrative — promotion.

2. Educational — motivation, knowledge, guidance.

3. Social — privileges extended or revoked.

To this short introduction about tests and measurement in the field of education, is appended the following bibliography of objective tests in the industrial-arts field. By scanning the list, the reader will, doubtless, come to the conclusion that there is very little testing material available in electricity and auto mechanics. The list should be especially valuable to new teachers and potential teachers in training, for this material contains some of the essential facts and skills that they are trying to master. Many new teachers are constantly trying to determine just what is important. Securing some of these tests and scanning them may probably assist in securing an answer to this question.

While this bibliography of testing materials is not complete, it will, nevertheless, be found helpful, and it may easily be made more complete by adding to it as new tests come under the reader's observation.

Architectural Drawing

Tests which appeared in INDUSTRIAL ARTS AND VOCATIONAL EDUCATION:

1929, February, p. 75, Final Examination for Beginning House Drawing, H. H. Robinson.

1931, April, p. 141, Architectural-Drawing Test, W. G. Hjerstedt.

1933, January (Suppl.), Architectural Drawing Test No. 3; April, No. 4 (Suppl.); September, p. 290, No. 5 (Suppl.), Ren Aton.

1933, March, p. 148, Architectural-Drawing Test (Suppl.), J. H. McCloskey.

1934, January (Suppl.), Architectural Drawing Test No. 3; April, 4 (Suppl.); September, p. 290, No. 5 (Suppl.), Ren Aton.

1935, September, p. 270, Architectural Drawing Test No. 6 (Suppl.), Ren Aton.

1936, July (Suppl.), Architectural Drawing Test No. 7 and Scoring Sheet, Ren Aton.

Auto Mechanics

Automobile Mechanics Test (multiple-choice), Manual Arts Press, Peoria, Ill.

Automobile Parts Test, Hunter. Manual Arts Press, Peoria, Ill.

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What the Shop Instructor Needs to Know

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Factors which must be considered by those engaged in the training of instructors for trade and industrial classes.

The instructor in trade and industrial lines is a manager in that he manages people, processes, and procedures. He must, therefore, be conversant with and observe the basic principles and procedures of management, often termed the 7 M's (men, machines, materials, methods, money, markets, and morale).

He must start with the raw material (learner, semi-experienced, or even experienced men) and bring this raw material up to the finished state (the trained worker). The procedure must involve additions, changes, and improvements in two important factors: *trade knowledge* and *trade skill*. Or, in still broader terms, it should include the *big four:* trade knowl-

edge, trade skill, reasoning ability, and proper trade attitudes.

Furthermore, this training must be done efficiently, i.e., with maximum results based on minimum costs. In fact, in many ways, training may be looked upon as falling in the field of economics where results are closely measured against costs in determining the efficiency of any process or procedure: Efficiency = Results ÷ Cost.

Due consideration must be given to the fact that practically all instructors in the trade and industrial field come in through one of three *gates:* (*a*) From trade and industry itself; (*b*) from normal schools or colleges of education; (*c*) from engineering colleges. Each group has special advantages and disadvantages to be considered in a training program. One group is long on trade experience and short on pedagogy and science; another is long on pedagogy but short on experience.

Since the instructor may have had school-shop experience or may later on function in one or more of seven different types of shops, (industrial arts, trade finding, trade preparatory, trade extension, college or normal school, engineering, or outside industrial shop), he must know and understand wherein the procedures and methods differ and wherein they are identical.

Furthermore, since there are seven or more types of jobs in industry (repairing, operating, assembly-disassembly, forming, production, construction, and technical), and since each type has its own peculiar or unique procedures, it follows that the efficient instructor must be ready to adapt himself to fit the special type or types of jobs confronting him.

Just as the blacksmith must know the structure and make-up of his iron or steel and how it reacts before he can intelligently work it, so the instructor must know how his raw material (learners and learners' minds) is made up, and how it responds to the various processes of training.

An efficient trade and industrial training program must, therefore, touch upon or include all of the following items:

A. Knowledge, experience, and use of the whole field of the trade to be taught.

B. Determination of the limited field actually to be covered. Limiting conditions must be understood: funds available, time available, limitations of staff, and students, present and future trends, and the like.

C. Selection and organization of material to fit the needs of the special group in training (are they beginners or advanced men).

D. Equipment and instructional material to be used in the training program.

E. Preparation and use of outlines, instructional material, job lists, job sheets, and job check sheets; also necessary records, progression charts, and the like.

F. Selection and use of texts, reference books, manufacturers' catalogs, and trade literature.

G. Specific jobs to be used to put across the desired trade skills and trade knowledge (selection of jobs depends on factors like cost, sales, equipment available, material cost).

H. Necessary related or functioning knowledge.

J. Selection of students, giving due consideration to school laws, employers' requirements, policies of the school (to train large numbers or a selected few).

K. What prerequisites to set up in the matter of age, experience, ability to meet tests, and similar items.

L. How the learner's mind works: how habit psychology functions; what are interest factors; why training calls for repetition; relation between *hearing, seeing, and doing,* and other so-called practical applications of psychology to the training program.

M. How the shop training may be well organized to teach shop skills, but unorganized to teach proper trade attitudes (for example, the student may consciously acquire skill but unconsciously acquires habits of "sloppy" attire).

And last, but not least, actually to do the training job, we must know the methods, procedures, and devices needed:

1. To assign the job (orally or by job sheet, blueprint, and instruction sheet).
2. To teach the job (by telling, showing, or by providing opportunities for gaining experiences).
3. To supervise the student on his job.
4. To check his job and his results.
5. To dispose of his jobs (sales).
6. To keep records for comparison.
7. First to emphasize *workmanship,* and later on *speed* — the two elements the employer demands.
8. To get the student to build up his two "tool kits" — trade skill and trade knowledge.
9. To help the student generalize and develop resourcefulness to fit into the commercial job where he must operate other machines, work on other materials, and follow other procedures and processes often quite different from those he had in the school shop.
10. To store his supplies; jobs in process, and tools.
11. To manage his shop efficiently.
12. To order stock, store surplus, and to inventory same.
13. To plan ahead.
14. To change his training program to take care of ever changing needs in his field.
15. To place his product (the trained student) and how to profit by this placement contact, so that the next "batch" of trainees will be "stepped up" in value.
16. Two methods of analysis for teaching trade: "The trade analysis into skills" — the approach often called the Selvidge plan, and the "trade analysis into jobs" — the approach often called the Allen plan.
17. To use a call staff.
18. To use student foremen.
19. The concentric method, i.e., job as nucleus, with shop knowledge and trade knowledge as concentric circles.

The shop instructor is often called upon to do "nonteaching" jobs, and this is explained in the outline below. The methods, procedures, and objectives vary in each school and in each shop.

Teaching	teaching jobs
	instructing jobs
	training jobs
	supervising workers
	checking
Nonteaching but in department	equipment maintenance
	supplies maintenance
	shop maintenance
	department records
Out of department	about building
	helping in office
	general records
	trade contacts

These factors come up almost daily in the instructor's routine; and he needs and welcomes help in all of them.

Social Significance of Vocational Training

Sterling Lord

Secretary, The Leopold Company, Burlington, Iowa

The vocational instructor's job, as seen with the eyes of an employer.

Vocational training, no matter what its primary objective may be, spreads itself into the very fabric of the social order. It can be definitely classified as true education in the sense that it teaches how to live and how to enjoy life.

We are emerging from a tremendous social cataclysm with the uprooting of traditional social outposts. Throughout, one tenet has remained undisturbed. Our belief in the value of character, or shall we call it "attitudes." Vocational training, in its dual capacity as teacher of the hand and head, is essentially training, or directing, or building attitudes.

The term *vocational training* implies by

its meaning a training for an occupation or profession. The term itself in its larger sense should refer to a training for the profession of living — of living gracefully. For the boys and girls who are not planning to devote their lives to the economical application of its teachings as a direct benefit, it also is of signal service. Vocational training, or occupational training, or by whatever name we choose to call it, brings not only the elements of a mental training, but a broadening sense of appreciation of life in its various avenues — a better understanding of life's values, a development of attitudes.

Again, what are we schooling for — to develop more highly the art of schooling itself, or to prepare for the adventure of providing a living, or are we directly concerned with the subject of the perpetuation of the home itself as the basic unit of our society? Does he who teaches thoroughly consider this?

A recent magazine article recorded a meeting, in which a group of young people, under the chairmanship of a professor, discussed the situation which confronts the youth of today. The concensus of opinion seemed to be that the youth of today — full of ideals, full of ideas, full of untried plans, was confronted by a cold, unappreciative world — without ideals and hog-tied to traditions. Apparently there was to be no room for the exercise of the priceless idealism with which modern youth was bubbling over.

It seemed to the writer that the discussion had overlooked a most important factor. Throughout the discussion, no mention was made as to whether the so-called "idealism" of this group was a rational idealism, a balanced idealism, which fed upon real soil. Having ideals, having objectives, is wonderful and impressive, but if the ideals fostered and nurtured are irrational, and false, they can only be creative of disorder.

If there exists such a wide divergence between the ideals of this group of youth and the world wherein they propose or hope to practice these ideals, it is well to ask, have they really correctly interpreted this world? Granting for the sake of argument that they have made the right interpretation, then their so-called "ideals" should be interpretive to it. What a tremendous responsibility confronts the educator who attempts to mold the minds and character of our youth.

In vocational training full consideration must be given to the training of the mind, not only as its direct co-ordination to the hand, but toward the vocation itself, toward other vocations, and toward the evolution of vocations.

A short time ago, someone discussing a certain artist said, "You know, his work is so different. He is not tied down by tradition." Tradition — what a big, bad wolf it seems to have become in these modern times. Tradition is the hoped-to-be "Forgotten Man."

Tradition need be no dictator — no domineering master. Tradition is but a wise mother, around whose knees we can gather for counsel and guidance. In the mellow graciousness of wisdom, there need be no commands, no limitations.

In this youthful group, then, there could be, and should be, ideals. Far-reaching ones — new, perhaps, to tradition as we know her, but still quite acceptable to her.

But this leadership of youth, which, by the way, is becoming more youthful itself, ought to strive to become a better balanced leadership. It ought to be leadership which disapproves of the so-called traditions only because it thoroughly knows the established order, not a leadership that scoffs at an established order of which it is quite ignorant. Young men should be cautioned to defer judgment until they have had time to weigh the values carefully before they form their decisions.

Vocational training, like other educational branches, is advancing rapidly. It is experimentally working into new fields, yet its deepest significance still remains the cultivation of attitudes.

Divesting the subject of its theoretical wrappings, the problem involves the training of our youth so that it is able to be assimilated into the industrial life, become self-supporting units, contributors of inspiration and idealism, and creators of homes with the least possible waste of time, and the lowest rate of individual fatality.

To do this, the affiliation between the practical side of the community life and education must be made as close as possible.

We are passing out of the era when work with the hands is considered undignified. There is less and less divergency between the "white-collar" class and the overall class.

The machine — that skeleton in the closet — is but removing from the worker's back that dull, monotonous, repetitive work. Hand labor will return with its dignity, with increased pleasure, with more commensurate reward. We are getting beyond the theory that life is a bread-and-butter matter. We, as a people, are demanding the right to live more beautifully, more graciously, and vocational training is an effective missionary toward these ends.

Tradition, paradoxically speaking, is teaching us that nothing is so permanent as change. As the race develops and advances, new forces are created, which are combinations of previously recognized elemental forces.

We must be philosophically keen to recognize their existence. Man primarily was interested in concrete things — securing his food, protecting his own life and the lives of his family, providing a shelter. Man in his later development has become interested in abstract matters.

Is it not a possibility that when the balance of national or international thought is diverted from the field of concrete application, such as devotion to the trades and arts, and enters into the field of abstract thought, we immediately experience a period of social unrest and disturbance?

Every truly great artist, musician, or artisan also was a philosopher and a student of life. A study of the lives of these men unearths a curiously interesting wealth of philosophical qualities.

Those who are interested in vocational education cannot fail to be deeply impressed with the tremendous scope of this work, and the big opportunities and grave responsibilities which confront the teachers of vocational education.

Current philosophy seems to demand for our youth an ease in the enjoyment of the things that are. Is it not better to plan for them a finer understanding of life and a reaching forward to still broader fields through effort and achievement? Vocational educators, may you ever dedicate your efforts to keeping the heads of our youth in the clouds, and their feet upon the solid ground.

MECHANICAL DRAWING

J. K. Olsen, Chicago, Illinois

A. Shows exact design and shape where a picture portrays merely the external appearance

B. Determines the workability of an idea on paper

C. Illustrates both inside and outside construction

D. Defines the exact shape of every detail

E. Shows the object correctly where verbal instructions or descriptions may be misunderstood

F. When properly executed, serves as an error eliminator

G. Is an essential requirement in man's education for present-day civilization

H. Is an absolute necessity for the inventor and mechanic

J. Helps develop constructive imagination

K. Promotes the habit of exact thinking

The boys' home-economics club

Initiating and Administering School Clubs

Eben E. Bow
Principal,

Clinton L. Carter
Chairman of Clubs,

R. R. Bedker
Longfellow Junior High School,
Wauwatosa, Wisconsin

The school-club idea is gaining more and more ground. This article, therefore, should be helpful to many teachers.

The introduction of clubs as a regular part of our school curriculum is meeting a real need. A pupil's many interests are given tryouts through club activities, and hobbies are developed which furnish the source of many enjoyable hours that otherwise might have been spent in idleness. Clubs do not provide complete preparation for any of the vocations, but possibilities for directing skills, talents, artistic tastes, and inclinations are provided.

To have a successful club program in any school, it is necessary to have a faculty which is "sold" on the idea of clubs during the regular school day. Before inaugurating the club program, teachers should be given information and instruction as to the correct procedure to be used in sponsoring a club. They must feel the need of sponsoring a club; otherwise, there will be a feeling that the clubs are not a necessary part of the curriculum but just something extra to do.

Clubs are a natural outlet for pupil interests, so their enthusiasm for such a program is spontaneous. Pupils should be presented with a suggested list of clubs, and then they should be given an opportunity to suggest other clubs that would provide for their interests and eliminate some of the clubs already listed.

Having developed a proposed list of clubs that the school expects to organize, the teachers should be permitted to indicate three or four different clubs that they would be interested in sponsoring. This would give the club chairman a chance to arrange satisfactory sponsors for each club. It is very important to have the teacher interested in the club he sponsors. It will be necessary in a few cases for a teacher to take a club that he has no present interest in, but a willing teacher can soon develop an interest.

Club Information

A brief summary of the aims, purposes, and activities of each club likely to be organized should be presented in a school handbook or club bulletin. This information is very valuable for the pupils, parents, and teachers. The articles should be written by the sponsor of each club. Here are two sample write-ups:

Home-Economics Club

The objectives of this club are to form a connecting link between the home and the school; to train young girls to be active and efficient leaders in the home and community life, and to furnish an opportunity through organization, for social life such as programs, teas, etc.

Puppet Club

Have you ever wished some favorite toy would come to life? Most of us have, and the

WJHS
LATIN
HI-Y
GR
AERO
Longfellow
Junior High School
WAUWATOSA, WISCONSIN
This Certifies that
Having completed _____ Points of Extra-Curricular Activity Work in the Longfellow Junior High School, as approved by the Faculty, is hereby awarded a certificate as indicated by the attached seal.
Given this _____ day of _____ A. D., one thousand nine hundred _____
President of Student Council
Principal

Certificate for extra-curricular activities

Puppet Club is the place for that to happen. A block of wood, a bit of paper, and behold, you have a little man that talks and walks. Of course, the miracle is the result of the nimble fingers of pupils who are interested in making these funny little people.

A schedule of the clubs giving the time and place of meeting and the name of the sponsor should accompany this information and discussions about the clubs should be held in the homerooms. Pupils should not be made to join a club. A study club should be provided for those who do not have some interest to follow. The schedule might include some of the following clubs:

A Capella Chorus
Art Needlecraft
Art Try It Club
Astronomy Club
Booklovers' Club
Boys' Athletics
Boys' Cooking Club
Boys' Glee Club
Checker Club
Chess Club
Etiquette Club
Fix-It Club
Girls' Athletics
Girl Reserves
Handicraft Club
Hi-Y
Home Economics Club
Junior Dramatic
Knitting Club
Latin Club
Leather Tooling
Library Club
Little Theater Club
Metalcraft (Girls)
Model Airplane
Nature Club
Orchestra
Pep Club
Presidents' Club
Press Club
Puppet Club
Radio Club
Safety Cadets
Science Club
Sports Club
Stamp Club
Student Council
Travel Club
Tropical Fish Club

The first club period should be for "try-outs." At this time, the pupil really tries out the club, for he has an opportunity to visit several clubs in order to find out more about their activities. Having made the choice of his club, the pupil signs the "Activities Enrollment" form. The filled-out forms are then turned in to the chairman of the club program. As the forms are sorted into club choices, it is sometimes found that a few clubs have too many pupils enrolled, and some clubs do not have a sufficient number enrolled. It is then the duty of the principal and chairman to interview pupils in the overcrowded clubs and make adjustments wherever possible. Sometimes a large club may be divided into two clubs and an additional sponsor secured. Once a pupil has signed up for a club, no change should be made without the permission of the principal or club chairman.

Club Registration and Procedure

Each club should provide the office of the principal with some form of club registration, and the clubs should be listed on the pupil's program card in the office. In conducting the clubs, Roberts' Rules of Order should be followed. All programs should be planned two weeks in advance by the sponsor and club officers. Weekly club reports sent to the principal or club chairman give a definite check on the activities of each club. The principal or chairman should call in the sponsor and officers of each club for friendly conferences.

Clubs should be afforded opportunities to show what they are doing by means of weekly exhibits on enclosed bulletin boards, assembly programs, and a yearly hobby show.

Each school should make an attempt to evaluate its club program, and suggestions for improvement should always be in order.

Auto Mechanics in the High School

U. L. Mackey

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The author's conception of what auto mechanics, taught as an industrial-arts subject, contributes to the high-school curriculum.

The contribution of any subject to secondary education may be measured by the amount it can be shown to contribute to each of the seven cardinal principles as set forth by the National Educational Association.[1] The writer has attempted to show how auto mechanics, as an industrial-arts subject contributes to health, fundamental processes, vocation, worthy home membership, civic and social ethics, use of leisure, and ethical character.

Health

Health may be, to a great extent, the result of habits of cleanliness, conservation of strength, safety precautions, and knowledge of occupational hazards. Cleanliness may be "caught" but not taught. The auto shop will become the most insanitary department of the school plant if teacher and pupils do not take an active part in keeping it clean. At the close of every period, each pupil should be held responsible for a certain portion of "clean-up work."

Problems of proper heating, lighting, ventilation, and their effect upon health may be brought to the pupils' attention. Certain boys may be assigned to visit a few of the best shops in town and make reports to the class on how these handle the problems of cleanliness, light, heat, and so forth. Pupils should be encouraged to make use of any practical suggestions that may be feasible. In this way, desirable habits are formed which could never be established through precept.

Through his participation in shopwork, the boy learns about many occupational dangers and how to avoid them. He is shown the value of good health and becomes a factor in providing methods and means for making his shop a safe place in which to work.

City and state regulations for the promotion of safety may profitably be used as the subject of a special report or for a group conference. The importance, use, and care of safety appliances on the automobile may be stressed in an auto-mechanics class to much greater advantage than in connection with almost any other subject.

Fundamental Processes

Many boys dislike reading because they have never found anything of interest to them. Through an interest gained in the auto shop, some of them are stimulated in reading on this and related subjects. In this way, auto mechanics can be made to help in vitalizing the work of the school.

Many school subjects which were abstract and uninteresting to the boy, then become real. The boy who found figuring the capacity of cylinders a dull study in arithmetic, takes an entirely new attitude when figuring the piston displacement on an automobile. Physics may seem too technical, but the principles of physics become interesting when he sees their application in the automobile. The law of levers applies in engine construction and steering gears; Ohm's law applies to the electric system; Hook's law applies to the springs; reflection and refraction of light apply to the headlamps; convection and radiation of heat as described in the physics book apply to the cooling system of the car upon which he is working.

Chemistry also becomes a vital subject when the pupil discovers the connection between the chemistry in the text and that of the storage battery, lubricating oils,

[1] U. S. Bureau of Education, Department of Interior Bulletin 35, 1918.

casehardening, tire vulcanizing, or body finishes. Themes upon automotive subjects may be assigned to the pupil by a little co-operation with the English teacher. These may be read before the auto class after corrections in English have been made by the English teacher, thereby serving a double purpose.

When we stop to realize that in the average automobile there is a complete power plant employing practically every principle of the large-city lighting and power plant, with its generator, motors, relays, solenoids, switches, thermostats, induction coils, lamps, and battery, we can understand that the boy who is thoroughly conversant with this has a fairly liberal education in the application of physics. Many boys who otherwise would drop out of school are staying because they have the opportunity to take auto mechanics two periods a day.

Auto mechanics forms a direct connection between school and actual life. The school is enabling the student to do better the things which he will have to do in actual life. Few boys will object to a study of fundamentals when those fundamentals are closely associated with interesting applications that function directly in everyday life.

There is no better place for the boy to learn the economics of automobile ownership than in an auto mechanics class. The purpose and methods of registration, methods of taxation, how values are arrived at, why titles are necessary, and how transfers are made can well be made the subject of study and research.

Systematic methods of locating automobile trouble are demonstrated and used. The fact that the man who knows *how* will always have a job, but that the man who knows *why* will usually be the boss, is impressed upon the pupils at all times. Habits of reaching a solution to a problem through the process of reasoning are encouraged. "Guess and try again" methods are discouraged. The boy is encouraged to develop initiative and resourcefulness so that he can work out his own problems.

The pupil, under the guidance of the teacher, plans his procedure, does his own work, takes pride in his own accomplishments, and discovers his own errors. "An error the pupil is stimulated to discover in his own work will be valued far above a hundred canonized mistakes listed by the teacher under the 'rain' and the 'reign' of red ink."[2]

Worthy Home Membership

The home has become mechanized as well as electrified. The worthy home member should have appreciation, knowledge, understanding, and elementary skills in the use and repair of these many home devices. Through auto mechanics the boy learns something of the proper use and care of the family car. Even though he may not be in a position to make major repairs, he should be capable of detecting trouble before it arrives and in this way contribute much to the motoring pleasure of the entire family. He also will be able to make many minor repairs on the appliances around the home. There will be a definite connection between things learned at school and the work in the home. Thus, the ability and resourcefulness in applying the school lessons to problems in everyday life are developed. There is probably no subject where the carry-over from school projects to home-life problems is greater than through auto mechanics.

Vocation

Through a study of auto mechanics, a pupil becomes familiar with the construction, maintenance, and repair of automobiles which will aid him in an intelligent choice of vocation. After working on the machines in the school shop he will learn about the problems which confront the auto mechanics, and be in a better position to appreciate the efforts of these men. During this course, the boy acquires technical information, receives practice, and gains ability which will be helpful should he later decide to enter automobile work as a vocation. In any event, the knowledge and skills gained will be useful to the boy no matter what trade or profession he may choose to follow. Men in all walks of life own and use automobiles and would profit by some knowledge of the machines they are driving.

The boy is given an idea of what will be expected of him if he should enter the trade. He learns of the training requirements and becomes familiar with the opportunities for auto mechanics in his community, knows the wage scale, and whether or not the field is crowded. He gains a considerable amount of technical information which will be helpful to him, should he enter definite training for this trade.

Citizenship

Through auto mechanics the boy learns that the laboring man has problems that demand attention and justify careful consideration. The informal atmosphere of the shop makes this possible. In the formal classroom, the pupils are in an unnatural setting and to this extent their development is hindered. In the shop, actual life conditions are more nearly duplicated and the pupil gets in closer contact with this teacher and fellow classmates. He gets the spirit of co-operation and learns that his best interests, also, are the best interests of the group. All these things he learns, not alone by reading them or hearing them from the lips of his teacher, but by participation in the group life of the shop. In this way, a boy's civic righteousness may be established in such a way that it will go with him through life.

Projects in this connection may consist of special studies, comparing costs of bus and truck transportation with that of the railroads; relative costs of traveling over good and bad roads; or relative costs of the materials, labor, and overhead in the manufacture of an automobile. The different forms of automobile insurance, the purpose of each form and what to expect of it; who pays the claims, upon what factors rates are based, and who establishes them may well be subjects of special reports and conference. In this way, pupils participate in solving problems that are of vital interest to them.

Ethical Character

"Industrial Arts, when properly taught, can aid in the development of character, because worthy habits, attitudes, a personal responsibility, the spirit of service, co-operation, and civic values, and some appreciation of the world's economic problems can be taught in a forceful manner."[3]

Through auto mechanics, pupils learn the value of exactness. The boy who considered 1/32 inch close measuring, now must deal with the thousandth part of an inch. He sees the need for accuracy and realizes its importance to the job upon which he is working. Resourcefulness is developed by meeting and overcoming the many difficult shop problems. The boy feels that he is actually doing something, not only preparing for the future. He sees the results of each day's work and is brought to realize that conscientious effort brings results. He finds that it is difficult to get credit for work done by someone else. He must work out his own problems.

The boy who is not succeeding in his academic subjects may choose or be assigned a shop project which is within his ability. The fact that he succeeds in this gives him more confidence and helps eliminate a possible inferiority complex. Every successful accomplishment adds to his zest for new fields to conquer.

Use of Leisure

The student of auto mechanics gets the thrill of modern invention. He is brought face to face with the fact that he is living

[2] *Creative Learning and Teaching*, H. L. Miller. Chas. Scribner's Sons, New York City.

[3] "Industrial Arts in the Senior High School," A. C. Newell. INDUSTRIAL ARTS MAGAZINE, December 30.

in a progressive mechanical age. He has learned something about modern automotive machinery. This creates a desire for more knowledge. Habits of reading are established. The boy who heretofore hated reading is now reading all he can find in mechanical books and magazines.

The boy who has not caught the reading habit may spend more of his time overhauling, redesigning or rebuilding some old car in the back yard. He may not always improve the car, but every hour he spends on it is one hour less in some questionable place of amusement.

Conclusion

In analyzing auto mechanics as an industrial-arts subject in the senior high school, we have shown how it contributes to each of the seven cardinal principles of secondary education. The boy who has completed a good auto mechanics course during his high-school training should have a broader outlook upon life, a better understanding of industry and labor, and the information necessary for him to become to a greater degree an efficient and satisfied consumer. He has learned to a greater extent to judge the value of new and second-hand cars, which is extremely important when a car is bought. He realizes the importance of automobile care and will lend his influence to see that the family car is always safe and in good condition for use. He can make many roadside adjustments and often save the family loss of time, temper, and money. He has caught the thrill of modern invention, he realizes that he is living in an age of mechanical progress, and he may even decide to further continue his education.

Make Your Own Visual Printing Aids

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The value of visual aids in any school shop cannot be extolled too highly.

We are indebted to the Chinese for being the first users of visual aids as they were supposedly the first to print their characters and illustrations from wood blocks. This may perhaps be substantiated by one of their ancient proverbs which says "One picture is worth ten thousand words."

It is a far cry from the early days of crude illustration to the present-day volume of illustrative advertising and the slogan of the photo-engravers: "Your story in pictures leaves nothing untold." During the course of time it has become increasingly evident that the quickest way to reach the individual in the shortest possible time is through pictures — the universal language.

Colleges have become aware of the value of visual instruction and many are offering courses for teachers on the proper application of visual aids to the classroom.

The average teacher of printing finds it difficult to cover his related subject matter effectively in the time allotted, because production work, keeping records, short periods, rob him of the time required for any lengthy discourses. But let the teacher tell his story required with pictures and he will find that with the proper guidance the subject is being visualized by the pupil in a shorter space of time than an all-oral explanation. Of course, he also is selling the printing vocation more effectively to the pupils when they can see the extent of the field it covers. A short quiz at the end of a session will serve to test the extent of what they have learned.

In making visual aids it is well to consider the source of material. Teachers of printing are familiar with the usual visual aids that may be brought or secured from large manufacturers, such as those on papermaking and wall charts issued by type foundries, and the like. It will be found, however, that a little effort at clipping and filing pictures selected from various sources, such as trade journals, magazines, advertising literature, and publications of all sorts, will soon result in the gradual assembling of complete sets of pictures which will not only be of interest to the students, but of great educational value as well. A great deal of time is required to assemble the pictures obtained, but they will gradually form into complete units and cover a variety of topics.

It is suggested at the outset that all pictures be mounted and that a uniform size of mount be adapted for all work. This greatly facilitates storage of units during the time they are not on display. A good size for the mountings is 8½ by 11 in., as they will then fit into a filing folder and may be filed away.

Subjects for which pictures can be obtained are of two classes, those illustrating practical lessons in printing and others which provide a cultural and historical background.

Suggestions of practical topics are:

1. Pictures of shop equipment.
2. Making printers' rollers.
3. Stereotyping and the making of a newspaper.
4. How photo-engravings are made.
5. Successive proofs of color printing.
6. Illustrations which show
   - *a*) Proper spacing of words and lines.
   - *b*) Uses of initial letters.
   - *c*) Indentions.
   - *d*) Press makeready.
   - *e*) Page imposition.
   - *f*) Proper and improper setting of advertisements.

Suggestions of topics for historical and cultural subjects are:

1. Origin of the alphabet.
2. History of printing from ancient to modern times.
3. Historical writing materials.
4. History of typemaking.
5. Famous printers and their contribution to typography.
6. Early American printers, notably Benjamin Franklin.

Another form of visual aid that is receiving much attention from teachers is the wall chart or exhibit. These may be put up for permanent use or exhibited from time to time on the bulletin board. Most of these exhibits take the form of sketches showing various printing operations. Pictures of famous printers and facsimiles of book pages from the earlier periods of printing are other forms of wall decoration.

These materials may be mounted on pieces of plywood about 16 by 24 in., that have been previously given two coats of lacquer. Printing plates may be nailed to the plywood, while type may be wired fast by drilling small holes through both type and wood, the wires then being twisted by means of pliers, behind the board, to secure the type firmly. Captions are stamped on a metal lettering machine and nailed fast under each plate and series of type specimens.

"How Type is Made" is a collection of specimens showing how type is cast by the linotype, monotype, ludlow, and foundry methods. The foundry specimens show type in the making, with jets attached. Other foundry type shown includes nineteenth-century specimens from the foundries of Johnson, Bruce, and MacKellar, Smith & Jordan. Linotype matrices are shown from the first brass stamping to the final tooling operation. Various sizes of type cast by the linotype are shown, including the faces

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INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

J. J. Metz, Editor

How We Are Judged

Recently a man who is in an administrative position in a private school that has a rather academic setup, visited a school system in one of the larger industrial cities. Upon being questioned as to whether he had visited the shops in a certain high school in that city, he said, "Yes, I visited them and I came away with the impression that they represent a great waste of money." Further questioning then brought out the information that this man's conclusion was based on observations made while going through these school shops, that while some boys were working, others seemed to be "lounging around, doing nothing."

Of course, this man is academically trained and knows little or nothing about shopwork. Naturally, also, he looked upon shops with the eyes of an academic teacher. But, making due allowances for all of this, is it not true that many school shops do not impress the visitor as doing a particularly good job? So often the instructor is very busy with an individual or a group while the rest of the class are doing just about what they want. Concentration is a very worth-while faculty to cultivate, but the teacher may not develop it to such an extent that while he is concentrating on the problem of one or a few students, the other students can put on a three-ring circus without disturbing him. It is forever necessary that the teacher dominate the entire situation. This is exceedingly difficult in large classes. It may even be said that it is next to impossible if the instructor attempts to do the entire teaching and managing job single-handed. It is well, therefore, to study the class-management systems of men who have mastered the art of successfully handling large classes.

Descriptions of the procedures to be followed with such classes have appeared in INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.* Those who are interested may want to check back and read these articles once more. They have all been written by men who have had actual contact with this method, either as teachers or as supervisors.

With the division of responsibility between teacher and student suggested in many of these articles, it is very much easier for the teacher to supervise the activity of the entire class. It gives him time also to help more boys individually, because he can safely concentrate on the task before him, knowing that the supervision of the class is taken care of.

This method also has the added advantage that it increases the learning situations in any given subject, adding as it does the supervising and managerial items which were totally lacking in the learning situations heretofore. This in itself gives this method an increased value because it multiplies the opportunities for self-activity for the student. The effect upon the student, is, after all, what the teacher must bear in mind when he considers anything connected with teachers' procedures. Since, then, the system of dividing the responsibility of conducting the school shop between teacher and student not only helps the student but aids the teacher as well, it is hard to understand why more teachers do not make use of it.

The work in any field is more often judged by its shortcomings than by its superior accomplishments. Teachers of industrial arts and vocational education must, therefore, strive to do their work so that there will be less opportunities for adverse criticism. The method of shop-class management referred to in the foregoing has been used with remarkable success by some shop teachers. It deserves careful study and a thorough trial.

Ottmar Mergenthaler

It may be quite safely stated that no improvement in modern printing methods has had results that were quite so far-reaching as those achieved by the invention of the linotype machine. Like other labor-saving machines, it displaced some skilled men in the early days of its existence, but it has augmented the use of printing to such an extent that there are now a far greater number of printers employed than ever before.

As so frequently happens to great inventors, comparatively little is known about Ottmar Mergenthaler who is the originator of this ingenious machine. The far-reaching results brought about by his invention, however, make the little that is known about him, exceedingly important.

He was born in Bietigheim, Germany, in May, 1854. His father was a teacher, and expected that his son would take up that same profession. Ottmar, however, was mechanically inclined, and persuaded his parents to permit him to indenture himself to a step-uncle, a Mr. Hahl, who was a clockmaker. As was customary at that time, apprentices paid a premium to the employer who taught them their trade. These learners also served the four years of their apprenticeship without wages, although they received board and lodging from the employer who engaged them. Ottmar took his work very earnestly and developed so quickly that Mr. Hahl voluntarily paid him wages during the last year of apprenticeship, a procedure which was quite uncommon.

Besides working at his trade during the day, young Mergenthaler attended evening school to improve himself further. In 1872, when he had finished his apprenticeship, he emigrated to America, landing at Baltimore in October. He had previously corresponded with August Hahl, a son of the step-uncle under whom he had learned his trade. August was

*1927: March, p. 102, A Shop Foreman Plan, Paul V. Wilcox.
1928: August, p. 278, Successful Organization Schemes, Ed. N. Wallen.
1929: October, p. 375, Class Control, P. Francis Edgar; September, p. 338, Promoting Shop Efficiency, J. E. Bond.
1930: September, p. 335, Shop Management and Discipline, Raymond N. Doneson.
1931: September, p. 309, Shop Class Management, Carl J. Orness; October, p. 361, Student Participation in Checking Mechanical Drawings, E. A. Rerucha.
1932: August, p. 244, Class Management in the Foundry, T. J. Brown; April, p. 109, Industrial Education in Hamtramck Public Schools, Harold J. Van Westrienen; June, p. 180, Organization of an Interned School Drafting Room, Richard M. Carlsen; July, p. 205, The General-Shop Idea, Earl L. Bedell; June, p. 194, School-Shop Management, H. W. Paine; March, p. 87, Pupil-Personnel Organization, Harold J. Davison and Earl L. Bedell; February, p. 61, Organized Woodshop Procedure, B. W. Schneider.
1932: BRUCE'S SCHOOL SHOP ANNUAL: p. 169, Shop Management in the General Shop, Earl L. Bedell.
1933: August, p. 245 and September, p. 282, Handling Large Classes, Harold J. Van Westrienen.
1935: January, p. 3, School-Shop Foremen's Clubs, Ward W. Swain and R. Randolph Karch.
1936: December, p. 374, General-Shop Organization, James C. Jenkins; January, p. 199, General Shop and the Student, Harold J. Davison.

at that time manufacturing electrical instruments at Washington, D. C., and he engaged Ottmar as a mechanic. Before two years were over, Mergenthaler had been advanced to the position of foreman.

At Washington he had a good opportunity to study both inventors and inventions at short range. In this way, he soon had opportunities thrust upon him to use his mechanical ingenuity for perfecting some of the articles patented. In this way, he worked on one of the earlier typewriting machines. He improved it but personally did not hold much hope for its eventual success.

In 1883, J. O. Clephane, who had been financially interested in various of the patents on which Mergenthaler had worked, proposed to him to build a machine which would do typesetting. After much study of what others had done in solving this problem, and after extended experimentation, he produced a machine which actually worked. Ten or twelve persons were present when the first line of type was produced on it, but it was not yet ready for the market, and Mergenthaler worked at its improvement and simplification for several more months. Finally, in February, 1885, it was ready to be shown to the printing world. The machine was given the name "linotype" by Whitelaw Reid, then editor of the *New York Tribune,* where the first Mergenthaler typesetting machine was installed. So well did the machine satisfy the demands put upon it, that the *Tribune* installed eleven more within the year. While this newspaper is said to have saved $80,000 with the machines in the first year, the inventor received a royalty of only $50 on each machine.

Mergenthaler and others continued to improve this extraordinary typesetting machine until now it is wonderfully versatile and efficient, and is widely used by printers and publishers for many different purposes.

Ottmar Mergenthaler did not live to enjoy the fruits of his far-reaching invention. In 1894, he developed tuberculosis. He died in 1899. His invention had not amassed a fortune for him, but his genius and ability were recognized by the award of a medal from the Cooper Institute, New York; the Scott medal from the city of Philadelphia, and the Cresson medal by the Franklin Institute of Philadelphia.

Vacation Approaches

As the end of the school year approaches, the busy shop teacher must be careful not to overlook the many items which crowd in upon him with increasingly greater insistence as the last day of school draws nearer. There are so many details to be thought of. It may be helpful, therefore, to have a check list, which, though it may not be complete, may be used as a reminder of the things to be prepared for during the coming days. Of course, this check list has appeared again and again in our columns, but because new readers may not have back copies of the magazine at hand, and yet need this reminder, this last-minute check list is given herewith.

It is timely, while school is still in session, to make a thorough checkup on existing equipment to see whether it requires repair or replacement. Small tools also must be scrutinized to see whether they can be reconditioned or whether replacements are in order. Then, the need for additional equipment, tools, and materials has to be determined, and requisitions must be written out for the articles that are wanted.

Then there may be possible changes which can be made in the school shop itself. Probably the benches, tool-housing facilities, the larger pieces of equipment, the projects cabinets or bins, material-storage racks, and the like, can be rearranged in a way to make certain parts of the classroom work easier to conduct or oversee. Major alterations in the room itself may probably be necessary. It is well to plan for some of these things now, even though the actual work will have to be undertaken during the vacation period.

Some of the items that need attention can be handled directly with the boys. There are always some students who finish the required work ahead of time. It may be well to form these into maintenance squads and assign to them tasks such as the reconditioning of benches, refinishing of bins and cabinets, painting of storage racks, sharpening of tools, overhauling of machinery, and a general cleaning up of the entire shop. If this work is properly inaugurated with the students, and if it is judiciously supervised, it will not only be well done, but the students working at the tasks will feel that they are doing something very much worth while.

Then, there is the preparation of an inventory on which is listed every item in the shop. It is well to have this checked over by someone in authority so as to eliminate embarrassing controversies later on, over items that have probably disappeared from the room during the summer period. It is well also to leave with this personage the keys for the shop so that no suspicion can be attached to the shop teacher himself. The teacher also should be sure to leave his forwarding address with the school. At times this item is overlooked to the serious detriment of school or teacher.

There are items, too, which directly affect the student's conduct during vacation. While these ought to be emphasized by every teacher, they are unfortunately overlooked only too often. Discussions, for instance, may be held, covering safety precautions which the boys should observe while they are "on their own" during the vacation period. Boys suffer or are guilty of causing untold damage to life, limb, and property during the summer months. Much of this is avoidable, and these last-minute safety discussions may, and undoubtedly will, prove very beneficial.

Some of the things to be warned against are the traffic dangers to youngsters playing, walking, or running on the highways; the dangers connected with the climbing of trees, of buildings under construction, of rocks and cliffs, and the like. Attention also should be called to the proper precautions to be used with fire. Talks may be given calling attention to the conservation of both the fauna and the flora of our country. First-aid drills and health precautions ought also to be given their proportionate share in these considerations.

Another thing that may be done, is to assist the boys in drawing up definite plans for different activities to be undertaken during the vacation period, thus giving guidance and direction which is sorely needed, since many boys have extremely little direction during the summer months from their parents or guardians. This, no doubt, accounts for the large number of juvenile delinquencies during the summer months.

This list could be extended considerably. However, if at least the points enumerated are covered, much good will come of it.

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and combinations available from a single magazine. Large size types cast by the ludlow are shown, together with a matrix. A few individual letters cast by the monotype are included in the exhibit.

"Printing Plates" exhibit some of the various plates used in printing operations. They include specimen, halftones, zinc etchings, stereotypes and electrotypes. Also included are copperplate linoleum, and wood block engravings.

Projection machines are used by a few printing teachers who have the time at their disposal for the use of this form of visual aid. These machines are made of three distinct types: stereopticons, opaque projectors, and motion-picture projectors.

Stereopticons can be found in many schools and arrangements can be made by the various teachers to have the use of the machine for definite periods or days. It is necessary to have slides or strip film for use with these machines.

By far the best type is the opaque projector which can be used to throw any printed picture on a screen. The screen itself is transparent — the machine being on one side of it, and the class on the other. This is necessary because the image would appear in reverse on a solid screen.

Motion-picture projectors may be purchased or rented. A license is generally necessary before this machine may be used. Libraries of films of which selections can be made are available in most large cities, and many industrial plants have suitable pictures which can be obtained by paying the transportation charges.

Agricultural Industrial Arts

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Giving the shop course in the small community an agricultural flavor.

Agriculture is the leading industry in the United States, and Wisconsin is one of the leading agricultural states in the union. Most of Wisconsin's small cities and towns are almost entirely dependent upon and supported by agricultural communities. Take this industry out of Wisconsin and little would be left.

In Wisconsin the small-town school supported by an agricultural community should certainly have agriculture as one of its basic courses. No boy or girl in such a community should be denied an opportunity to perfect himself in this basic industry. The life of the small-town community in Wisconsin revolves around agriculture, and for that reason instruction in agriculture should be made available for all students.

The ideal American farm is owned, operated, and managed by a single individual. This is all in keeping with the American ideal of individual freedom and much legislation is pointed toward the protection and perpetuation of this ideal American farm-home unit. Our educational system, too, should be designed and arranged to perpetuate it.

Agriculture and craftsmanship are inseparable. The successful farmer of today must be a skilled manipulator of tools and machines of all descriptions. Nearly every operation, from the preparation of the seed bed to the harvesting and caring for the crops, has been reduced to a mechanical one. The mechanical equipment required to perform these operations is extensive, varied, complicated, and expensive. All these machines require trained operators. The operator is usually the farmer who owns the production plant. To be successful, he must have a working knowledge of a greater number of mechanical processes than are required in most other industries. The successful farmer of today must be a "jack of all trades." Such being the case, instruction in mechanics is a vital part of all agricultural courses.

Besides operating his production machinery, the farmer must care for his buildings and equipment. The building and equipment on the average farm are extensive and represent a heavy investment. They are a vital part of the farmer's production plant, and proper care and management are essentials to success. Mechanical skill is an essential requirement to insure efficient management of this part of his production plant.

The courses of study, designed to develop mechanical skills and general knowledge of the mechanical tasks and problems that confront the farmer, are given such names as agricultural mechanics, farm shop, farm mechanics, and agricultural engineering. Agricultural engineering is a term that is quite commonly used, but to many it sounds a little too technical. A more fitting name that might be substituted is *industrial arts of agriculture,* because agriculture today is classed as an industry. *Industrial arts,* for the small-town high school, might be significant enough. In the main, the courses will have the same objectives regardless of the name. The main objective will be to supply the educational needs of the small-town community which requires that things pertaining to agriculture be accented.

Courses of study in industrial arts designed for the large-city systems, are not suitable for the small-town and city schools which are supported by agricultural communities. Frequently the industrial-arts courses designed for the large-city systems are introduced in the small-town high school with undesirable results. That is one reason why the name *industrial arts* has lost favor with the administrators of agricultural courses. They claim that industrial arts as taught in the small-town high school has been inadequate and, therefore, urge the discontinuance of this name and suggest that the work be given some name such as *farm shop.*

There is no reason, however, why industrial arts cannot be made to serve the agricultural community. The industrial-arts teachers may not deserve to be blamed entirely. Many of them were not completely fitted for the task assigned to them. An industrial-arts teacher, who is to serve in the small-town school should by all means have a few courses in general agriculture to his credit. Certainly a working knowledge of agriculture will be a decided asset.

In order to administer courses in industrial arts with agricultural objectives, the entire problem should be separated into groups that are in themselves closely related. The field of agriculture is so large that it cannot be handled as a single unit; therefore it must be separated into groups of related units, each of which is then treated more or less independently. These groups should be so arranged that they are indicative of the various phases of the farm problem.

The farm problem for instructional purposes should be separated and arranged into groups as follows: Buildings, machinery, power, and equipment. The various groups then should be analyzed as to objectives, skills, and general knowledge requirements. Skills pertain to manipulative processes, and general knowledge to material selection, use, and arrangement.

Farm building deals with the planning, arrangement, care, and repair of the farm home, barns, and buildings. The problem skills may be listed as care and use of woodworking tools, carpentry, painting, and mechanical drawing. The skills developed are not to be on an industrial par, but are to be commensurate with the farmer's problem. The general knowledge problem should include the study of materials of construction, building planning, and arrangement.

Farm machinery has to do with the care, repair, and operation of the planting, tillage, and harvesting machinery used on the farm. The development of required skills will require instruction in the care and use of metalworking tools, including forge-shop work, and the repair and adjustment of the various farm machines. The general knowledge requirement will include a study of the materials of construction and the selection of the proper farm machines.

Farm power will require a study of the various sources of power which will include the horse, gas engine, electric motor, and windmill. Skill must be developed in the care, repair, and adjustment of these various power units. The development of the skillful use of the common metalworking tools will be one of the aims. A general knowledge must be had of the working principles of the gas engine and electric motor. A study of the theory of electricity, because of its coming importance on the farm, must be made.

Farm equipment deals with the machinery and appliances such as milking equipment, lighting equipment, water systems, harnesses, feed grinders, fanning mills, and the like. The skill development in this unit will deal mainly with the care, repair, and adjustment of this equipment. Skills would include pipe fitting, harness mending, soldering, and electrical work. A general study should be made of the materials of construction and the wise selection of the various equipment.

All this may seem as though the suggested course were covering entirely too much territory, but by using the general-shop plan of instruction the task is not impossible. The agricultural slant can be successfully worked into any industrial-arts course. The tools and equipment found in most industrial-arts departments are sufficient to handle almost any agricultural assignment.

There is no reason why one student should not be working on a set of wagon eaveners, another on a harness repair job, while still another working on a piece of cabinetwork. Neither is there any reason why the town boy might not be repairing and adjusting an auto, while the farm boy is repairing and adjusting a tractor or a corn planter. In the drafting room, one boy can be working on a poultry-house plan, while another is making a machine drawing or a plan for a dwelling.

The industrial-arts course for any small-town high may be designed along the same lines — buildings, machinery, power, and equipment. This would prepare young men for service in their home communities and yet give them a broad industrial-arts training.

Model-Yacht Regatta

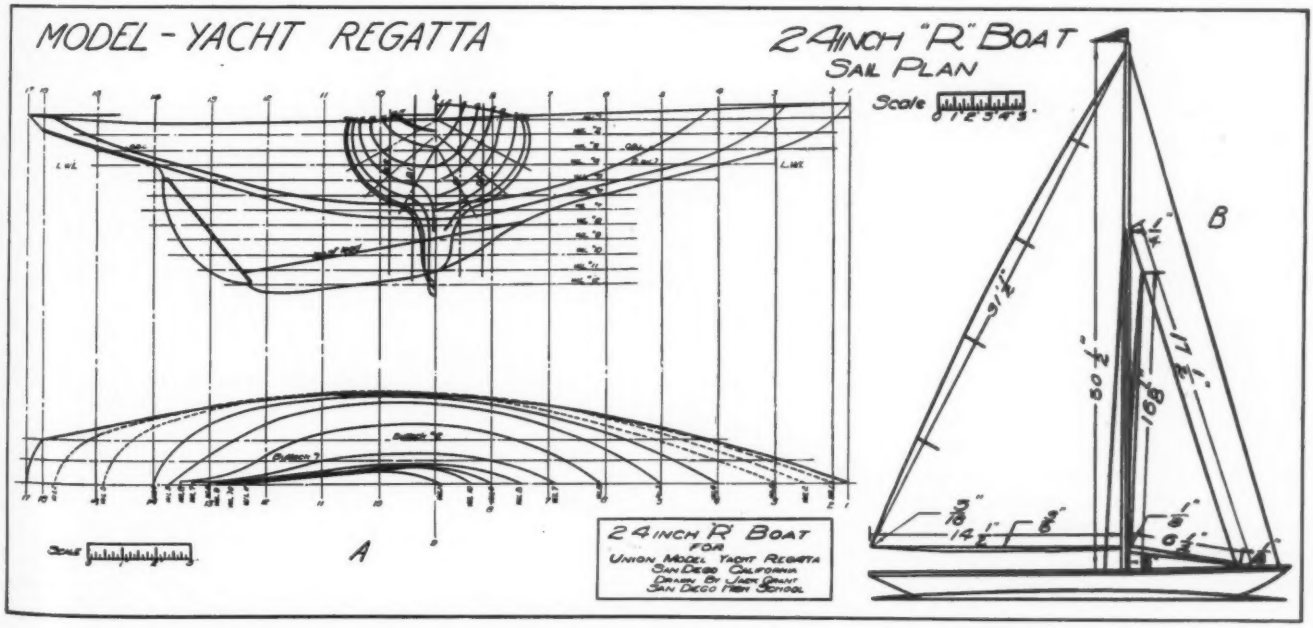
Percy H. Heron

Supervisor,
Technical and Vocational Education,
San Diego, California

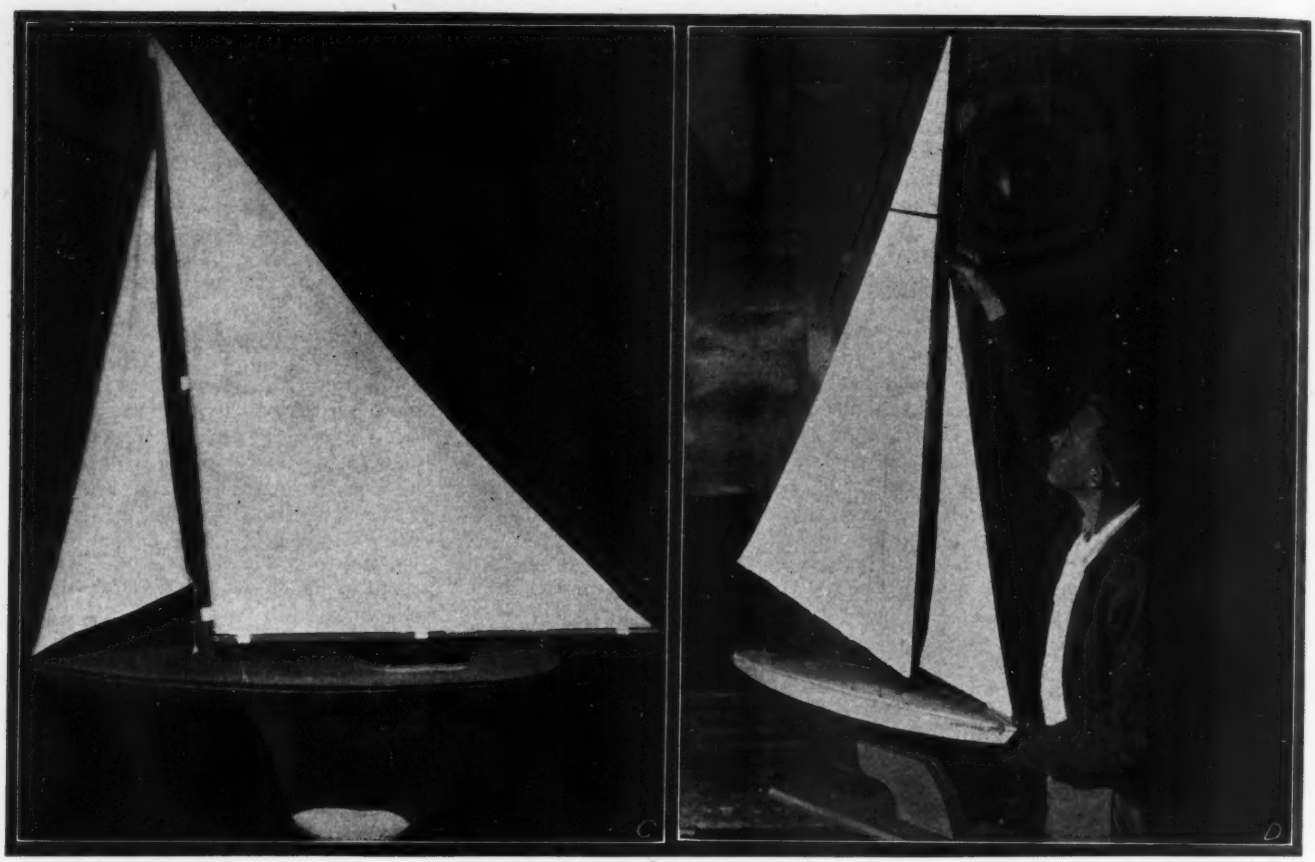
Rules and regulations for conducting model-boat regattas.

The model-yacht regatta brings into shopwork many activities that are incentives for boys to take a real interest in their work, and helps them to acquire many social, economic, and scientific principles in a natural way. Not only do the students learn many things about boat building, but they also become appreciative of San Diego as a place for yachting and boating sports.

For the past twelve years, under the sponsorship of the *San Diego Union,* the leading morning newspaper of San Diego, the model-yacht regatta has gradually grown until it is now one of the major



A. Typical working drawing used by the junior-high-school students in building their boats. They learn not only how to build a boat but also to interpret the blueprint. B. 24-in. R boat. Sail plan



C. 2-ft. metal model yacht. A popular design of the Memorial Junior High School sheet-metal-shop students. Earl F. Lucas, Instructor. D. Getting his boat ready for the annual regatta

events on the San Diego schoolboys' sports calendar. Mr. Ted Steinman, sports editor, Aylett D. Clark, a teacher in the San Diego City Schools, and the writer inaugurated the first model-yacht regatta in June, 1925, when 75 entrants took part. Because of the keen interest shown by the students, and their friends and parents, the *San Diego Union* has endeavored to make each succeeding regatta bigger and better, until this past year over 700 model yachts were entered.

So far as the sponsorship is concerned, the *San Diego Union* donates the prizes and publicizes the races. The actual work is done by interested citizens and teachers. Months before the annual event, teachers and students make plans for the eventful day in June when the boats built during the year, are tested out in actual competition.

Early in February, the wood- and metal-shop teachers plan to use the model-yacht regatta as part of a motivated project for the students who wish to participate in the events held in June. The project fits in with the course of study as it involves not only tool manipulation but also blueprint reading, shop sketching, geography, sociology, occupational information, history, and products of industry. In blueprint reading the boy learns to interpret drawings that are different from those used for furniture construction. Also the laying out of the lines and the contour of the boat is a new experience for the boys of the seventh and eighth grades.

The *San Diego Union* begins its publicity in the sporting section of the paper about February and continues it until the early part of May when articles appear each Sunday. Through the publicity of the newspapers, the importance of the event is brought, not only to the students, but also to the parents and the public in general. The widespread publicity given to the model-yacht race also brings the industrial-arts departments of the San Diego city schools in closer touch with the general public.

The sports editor, Mr. Steinman, and the sports writer, Ken Bojens, also arrange the appointment of the judges, starters, and announcers. They also get the trophies, arrange a float, secure the loud speaker, and the like.

Because of San Diego's interest in yachting and boating events, each year has seen an enthusiastic co-operative group of citizens helping as judges, starters, and announcers. Mr. Joe Jessop, one of the city's leading yachtsmen and businessmen, has been a booster for the event since its inception. He not only helps on the day of the races as the official starter, but contributes much time and effort in giving expert advice to the youngsters.

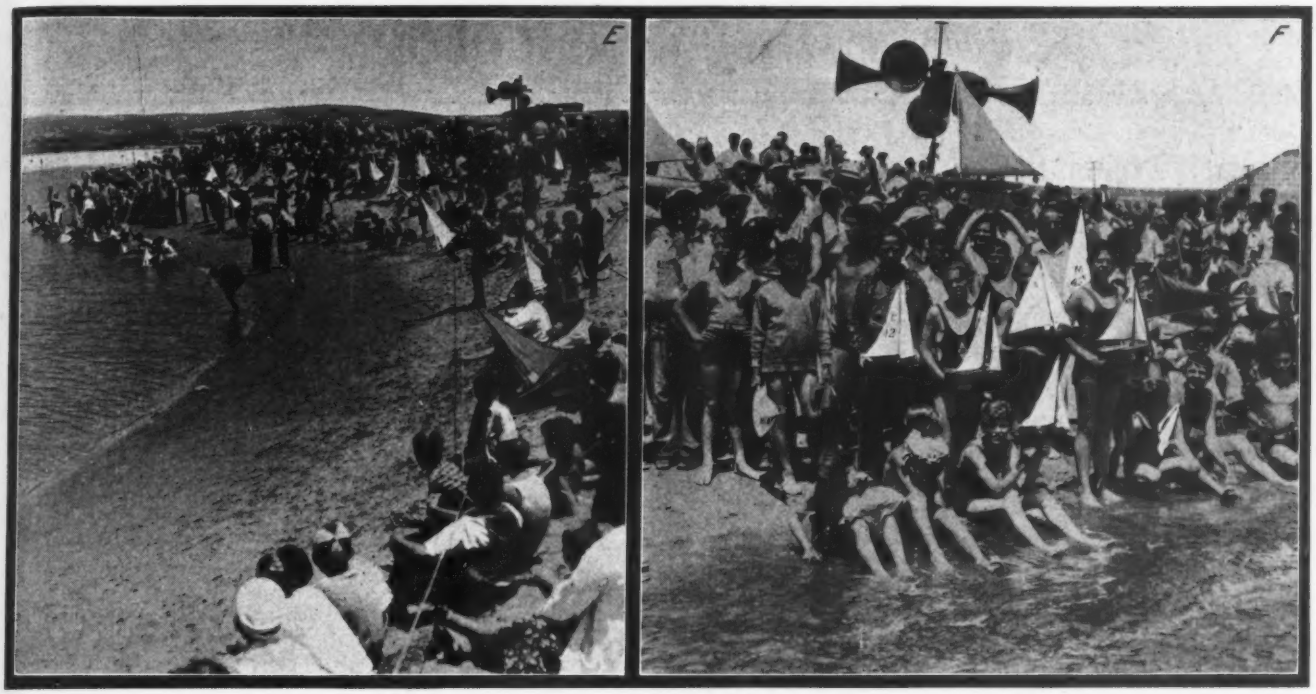
Trophies

Awards of silver trophies go to first-, second-, and third-place winners in the final races in all classes both sail and power. Certificates of merit go to heat leaders. In addition to regular race awards, a number of special trophies are offered for the best constructed craft racing successfully.

At the twelfth annual regatta, 66 silver cups were given to successful participants.

Rules

During the past twelve years, the rules have been changed a number of times, but the following model-yacht-regatta rules have been found appropriate for the conditions in which the students of the San Diego city schools operate. They may, of course, be altered to suit the conditions found in other communities.



E. Watching the yachts getting ready to sail. F. Contestants waiting for instruction from the judges. Loud speakers make it possible for everyone to hear and understand what is taking place

Model-Yacht-Regatta Rules

Classes of Sail Boats — Boats are divided into four classes, according to over-all length — one, two, three, and four feet.

The one-foot class shall be for students of the seventh grade only.

Over-all length of boats shall be defined as the distance from stern to stem of bowsprit, if the craft carries one.

Construction — Boats may be made of wood or metal, each type to race separately in regular competition. Wood boats may be either constructed from a solid piece of wood, built up, or by "bread-and-butter" construction.

Design — Boats shall be modified racing sloops, the designs and construction of the crafts to be left largely to the initiative of the builder. They must conform, however, to the following specific regulations:

1. Sail rig shall be single mast, fore and aft type.
2. The conventional pointed-bow sloop hull, shall have a minimum depth of one fourteenth of its length.

Sailing Regulations — All boats constructed during the current year (dating from the previous regatta) by students in grammar or junior high schools, compete in the regular class races.

Boats competing in the regular class are not eligible for the open class in the same year.

Boats of other years, which have competed previously may sail only in the open class. In the open division, wood and metal boats meet on equal basis. In the regular class the two divisions race separately. Senior-high-school students are eligible for the open class only.

Students will draw for starting positions on the float and take corresponding numbered positions.

Regular-Class Trophies — One-foot wood: Cups for first, second, and third places in finals, and certificates for first three in each heat and semifinal.

Two-foot wood: Cups for first, second, and third places in finals, and certificates for first three in each heat and semifinal.

Three-foot wood: Cups for first, second, and third places in finals, and certificates for first three in each heat and semifinal.

Four-foot wood: Cups for first, second, and third places in finals, and certificates for first three in each heat and semifinal.

Similar trophies will be offered in the same manner for one-, two-, three-, and four-foot metal boats.

Open-Class Trophies — One-foot wood or metal: Cups for first, second, and third places in finals, and certificates for first three in heats and semifinals.

Two-foot wood or metal: Cups for first, second, and third places in finals, and certificates for first three in heats and semifinals.

Three-foot wood or metal: Cups for first, second, and third places in finals, and certificates for first three in heats and semifinals.

Four-foot wood or metal: Cups for first, second, and third places in finals, and certificates for first three in heats for semifinals.

Power Boats — Boats must be constructed entirely by students and powered by motors made by themselves, except electric motors may be reconstructed from manufactured types.

Motorboats shall be of two sizes, 18 inches and under, and 3 feet and under. They are to be divided into three classes in accordance with motive power as follows:

1. Internal combustion, internal expansion, steam and compressed-air motors.
2. Electric motors.
3. Rubber-band and clock-spring motors.

Each class of boats, graded according to motor rating and size, will race separately. The course for rubber-band and clock-spring powered boats will be 50 feet and for all others 75 regardless of length of craft.

In case of steam engines, flash boilers are prohibited. All steam engines must have a safety valve. This is the only part of the power plant that may be purchased. Boats powered by rockets or similar explosive materials are not eligible.

Power-Boat Trophies — 18-inch class 1 motor: Cups for first, second, and third, and certificates of merit for the next three places.

18-inch class, 2 motor: Cups for first, second, and third, and certificates of merit for the next three places.

18-inch class, 3 motor: Cups for first, second, and third, and certificates of merit for the next three places.

3-foot class, 1 motor: Cups for first, second, and third, and certificates of merit for the next three places.

DESIGN

Industry has learned that a poorly designed article is difficult to sell. This truth suggests that industrial-arts projects in the future should be more pleasing to the eye both in form and in color. In other words, more attention must be paid to design. . . . It is believed, therefore, that in the future more beauty must be injected into industrial-arts projects and more attention given to the appreciation of good design. — *Harry E. Wood.*

Testing and Tests

OBJECTIVE TEST FOR AUTO MECHANICS*

Garland C. Richardson, Instructor of Auto Mechanics, High School, Bartlesville, Oklahoma

Text: *Automotive Essentials,* Ray F. Kuns, Bruce Publishing Co., Milwaukee, Wis.

This test is made for first-year high-school auto mechanics, based upon both recitation and laboratory work. It has three types of tests and has a time limit of one hour. Directions for each type are at the beginning of the group type.

Scoring Directions

True-false are scored right minus wrong.

Multiple-choice are scored the number right.

Completion are scored the number right.

However, when there is more than one blank to fill in, each additional blank counts the same as one question. The test sheet is made to take care of this item.

Your Name .....

Period ..... Score .....

True-False Test

DIRECTIONS: Some of the statements below are true and some are false. Make a plus (+) to the left of the statement if the statement is true, and zero (0) to the left if the statement is false, thus:

(+) The purpose of the lights is to facilitate seeing.

.....

( ) 1. The yoke type of connecting rod is used on the Chevrolet.

( ) 2. A micrometer is used to tell the revolutions per minute of a machine.

( ) 3. No harm is done to a reamer if it is turned backward.

( ) 4. At high speeds ignition spark should occur before upper dead center.

( ) 5. The Ford has a four-point suspended motor.

( ) 6. Alemite is a material used in valve construction.

( ) 7. Excessive lubrication is the cause of cylinder scoring.

( ) 8. Oil pumping is caused by poorly fitted rings.

( ) 9. Paper gaskets should not be shellacked.

( ) 10. Poor compression is due to a weak spark.

( ) 11. Neglect to clean the oil strainer may be serious.

( ) 12. Excessive choking causes oil dilution.

( ) 13. Air is an element used to absorb the heat of a motor.

( ) 14. Water pumps are often driven from the camshaft.

( ) 15. A thermostat regulates the flow in the cooling system.

( ) 16. Radiator shutters are always operated by hand.

( ) 17. A bearing should always be coated with "blue" when reduced.

( ) 18. Brake-lining rivets should always be countersunk.

( ) 19. Black and Decker make portable electric drills.

( ) 20. A cylinder gauge is used to measure piston diameter.

( ) 21. A thickness gauge is often called a feeler gauge.

( ) 22. Connecting rods should be adjusted without evidence of wear.

( ) 23. The purpose of the main bearings is to oil the crankshaft.

( ) 24. Failure of the oiling system to function is the principal reason for burned-out bearings.

( ) 25. The proportion of air in gasoline varies from 12 to 1, to 17 to 1.

( ) 26. Final carburetor adjustment should be made while motor is hot.

( ) 27. Failure of the cooling system will seriously affect the efficiency of the engine.

( ) 28. The engine is the most difficult part of the automobile to lubricate properly.

( ) 29. A simple test for oil is to strain it.

( ) 30. The oil pump is the heart of the oiling system.

( ) 31. The oil pressure gauge shows the amount of oil in the crankcase.

( ) 32. The outside rows of head bolts should be tightened first in replacing cylinder head.

( ) 33. Pistons will stick if fitted too tight.

( ) 34. A bent connecting rod should be left alone.

( ) 35. All valves should be ground sometime.

( ) 36. New poppet valves need not be ground.

( ) 37. A valve seat should be at least 1/16 in. wide.

( ) 38. When a valve stem heats it contracts.

( ) 39. The function of the spring is to open the valve.

( ) 40. In use valve springs become longer.

( ) 41. On a Ford Model A the camshaft is adjusted for end play by the rear main bearing.

( ) 42. Generator brushes are heavier than starter brushes.

( ) 43. There are two types of bendix drive design.

( ) 44. The lights will burn out if the generator cut-out points stick.

( ) 45. There are two requirements of good headlights.

( ) 46. The storage-battery separator is an insulator.

( ) 47. An element is a complete battery.

( ) 48. A fully charged battery tests 1,400.

( ) 49. Sulphation is caused by lack of water and not being in active use.

( ) 50. The normal charging rate for a battery in normal use is 10 amps.

( ) 51. The charging rate should be higher in summer than winter.

( ) 52. A clutch is not necessary.

( ) 53. The Ford Model A has two universal joints.

( ) 54. Torque means speed.

( ) 55. There are just three types of clutches.

( ) 56. The up and down movement of the rear spring is from 1 to 3 inches.

( ) 57. A slip joint universal is not necessary.

( ) 58. The rear axle has three major purposes.

( ) 59. There are 4 rear-axle designs.

( ) 60. The spider gear in the rear axle makes it possible to turn corners smoothly.

( ) 61. Starting a car quickly is more essential than stopping quickly.

( ) 62. There are three chief functions of the front axle.

( ) 63. There are three types of car springs.

( ) 64. The engine changes physical force into mechanical energy.

( ) 65. Heat, water, and wind are the physical forces that apply to engines.

( ) 66. The strokes of a four-cycle gas engine in order are: intake, work, compression, and exhaust.

( ) 67. There are two firing orders for a four-cylinder motor.

( ) 68. Overlapping of power gives smoothness in operation.

( ) 69. The type of fuel governs rate of compression.

( ) 70. The m.e.p. of the average American engine is about 90 pounds.

( ) 71. Over 50 per cent of all cars today use some form of aluminum pistons.

( ) 72. The difference between concentric and eccentric rings is in the cut at the point.

.....

Multiple-Choice Questions

.....

DIRECTIONS: Following the statements below you will find three possible answers. Only one of these is correct. Write the number of the correct answer to each statement to the left of the statement thus:

(2) The present Chevrolet has (1) four (2) six (3) eight cylinders.

.....

( ) 73. Automobile bodies are usually covered with (1) zinc; (2) copper; (3) body steel.

( ) 74. When purchasing an automobile chassis you would get a (1) transmission; (2) windshield; (3) body.

( ) 75. The present Ford motor car is the

*Copyrighted 1932, by the author.

(1) Model T; (2) Model A; (3) Model B.

( ) 76. When a gas is heated it (1) contracts; (2) expands; (3) remains the same.

( ) 77. The electric starter for automobiles was invented by (1) Westinghouse; (2) Edison; (3) Kettering.

( ) 78. A power plan is used on (1) some; (2) many; (3) all motor cars.

( ) 79. Most four-cylinder motors have (1) four; (2) six; (3) three main bearings.

( ) 80. Crankcases must be constructed (1) loose; (2) flexible; (3) rigid.

( ) 81. The crankshaft carries the (1) brakes; (2) valves; (3) connecting rod.

( ) 82. Valves are lifted from their seats by (1) torque tube; (2) ball races; (3) cams.

( ) 83. Large hose connections are necessary on (1) none; (2) few; (3) all motor cooling systems.

( ) 84. Vibration may be reduced by (1) countersinking; (2) counterbalancing; (3) increasing weight of moving parts of a motor.

( ) 85. The camshaft turns (1) two; (2) one; (3) four times to two turns of the crankshaft.

( ) 86. The ignition distributor is a part of the (1) carburetor; (2) electrical; (3) cooling system.

( ) 87. Accessories are (1) useful; (2) required; (3) of no use to motor transportation.

( ) 88. A spark plug (1) vaporizes; (2) fires; (3) condenses a fuel charge.

( ) 89. Installing valves requires a (1) jig; (2) shaper; (3) grinder.

( ) 90. To smooth a valve seat use a (1) reseater; (2) reamer; (3) refacer.

( ) 91. The Knight motor uses the (1) poppet; (2) sleeve; (3) rotary valve.

( ) 92. Valve timing is classed as (1) motor; (2) ignition; (3) wheel timing.

( ) 93. The ignition system (1) could; (2) makes no difference; (3) could not be timed if the motor was not in time.

( ) 94. The Ford Model A uses a (1) medium; (2) light; (3) heavy type of crankshaft.

( ) 95. Engine crankshafts move in an (1) oscillating; (2) vibrating; (3) revolving motion.

( ) 96. Aluminum expands (1) same; (2) more; (3) less than cast iron.

( ) 97. A piston stops and starts motion (1) two; (2) four; (3) three times in one four-stroke cycle.

( ) 98. A Ford ring is a (1) two; (2) one; (3) three-piece piston ring.

( ) 99. Fuel is forced into a combustion chamber on the (1) exhaust; (2) compression; (3) intake stroke.

( ) 100. Duco finishes are damaged by spilled (1) glycerine; (2) alcohol; (3) prestone.

Completion Questions

DIRECTIONS: In the statements below, one or more words or numbers have been omitted. Write the omitted words or numbers on the blank lines left to the right and below the question number and to the left of the statement. Need not fill blanks in the statement, thus:

MOTOR. The starter turns the ———.

101. ——— By chassis we mean everything except the ———.

102. ——— The device which makes the gradual application of power developed by the engine is called the ———.

103. ——— A gear change set is ordinarily called the ———.

104. ——— Gear changes are necessary to change the car's ———.

105. ——— A Ford Model A has ——— point suspension.

106. ——— Carburetion in a motor is accomplished by a device known as a ———.

107. ——— In low gear an automobile motor turns about ——— times faster than in high gear.

108. ——— The metal used in cylinder block construction is ———.

109. ——— The device which receives the power developed when a charge of gas is exploded in the combustion chamber is the ———.

110. ——— The device used to connect the wrist pin to the crankshaft is the ———.

111. ——— Bearings having no shims are reduced by ———.

112. ——— The part of the engine that keeps all the parts turning evenly is called the ———.

113. ——— The crankshaft is supported by ———.

114. ——— Connection rods are sometimes lubricated by dipping down in ——— located in oil pan.

115. ——— The Model A Ford lifts the oil from the pump by means of the ———.

116. ——— Gaskets are used to ——— leaks.

117. ——— The best position for the cylinder block when starting to assemble an engine is to place it on its ———.

118. ——— Camshaft bearings usually ——— adjustable.

119. ——— The ignition head is driven by the ——— shaft usually.

120. ——— Most gasoline engines are four stroke ———.

121. ——— Half-time gears run the ———.

122. ——— The most popular type of valve is the ——— valve.

123. ——— ——— valves do not require grinding.

124. ——— The angle of bevel on most valves is ——— degrees.

125. ——— A Chevrolet has the ——— type head.

126. ——— A Ford has the ——— type head.

127. ——— Eight-cylinder motors with the cylinders set at an angle to each other is called a ——— type motor.

128. ——— A rule for piston clearance in a cylinder using a ——— piston is one-thousandth inch per inch diameter of the bore.

129. ——— The oil supply is carried in the ———.

130. ——— The greatest enemy of an engine is ———.

131. ——— The true condition of the cylinder is determined with a ——— gauge.

132. ——— Cylinders should be reconditioned when ——— inch out of round.

133. ——— New pistons should be installed when clearance is ——— times what it should be.

134. ——— When volume decreases the pressure increases is ——— law.

135. ——— Gas when heated expands is ——— law.

136. ——— The device used to admit fuel to the combustion chamber is the ——— ———.

137. ——— A series of events occurring in a certain definite fixed order is called a ———.

138–39. ——— The two major parts of a passenger automobile are the ——— and the ———.

140–41. ——— The two general divisions in which most passenger cars ——— of today fall are the ——— and ——— types.

142–43. ——— Shims are of two types: ——— and ———.

144–45. ——— Pistons and valves are kept in the proper relation to each other by means of ——— and ———.

146–47. ——— Cylinder heads may be cooled by ——— and ———.

148–49. ——— Two types of water cooling systems are the ——— and ———.

150–51. ———Two methods of driving the generator are by ——— and ———.

152–53. ——— Two firing orders of a four-cylinder motor are ——— and ———.

154–55. ———Two methods of driving camshafts are by ——— and ———.

156–57. ——— Two materials of which pistons are usually made are ——— and ———.

158–59. ——— Connecting-rod bearings are made in two general types ——— and ———.

160–61. ——— The two most common types of rear-axle housing design are ——— and ———.

162–63. ——— There are two types of internal-combustion engines ——— and ——— cycles.

164–65. ——— Heat engines are of two classes ——— and ——— combustion.

Lectern made in the Pitmaston Road School, Birmingham, England. Mr. H. Norwell, Headmaster. Submitted by J. I. Sowers, Miami, Florida

A TEST FOR THE UPHOLSTERING DEPARTMENT

Herbert Bast, Vocational School, Sheboygan, Wisconsin

Here are principles or rules which you are supposed to have learned. Beneath each are two or more reasons, *one* of which is correct. Draw a circle around the letter in front of the statement which you think is correct.

1. Webbing stretchers are padded so:
a) Webbing may be stretched tighter.
b) It will not mar finished woodwork.
c) It will be easier to work with.

2. Small-faced hammers are used:
a) To be able to work faster.
b) To be able to get into deep corners and not mar woodwork.
c) As they are cheaper.

3. Regulators are used to:
a) Sew burlap.
b) Baste covering on temporarily.
c) Regulate the stuffing.

4. Curved needles are used:
a) To sew flat surfaces.
b) To sew leather.
c) As they are easily handled.

5. Straight upholstery needles are double pointed:
a) To permit sewing up and down without turning the needle around.
b) So you can sew better.
c) They are easier to work with.

6. Skewers are used:
a) To sew burlap.
b) To remove tacks.
c) As a basting pin for material.

7. Gimp tacks are used:
a) To tack on cloth gimp.
b) For tacking on webbing.
c) To trim the furniture.

8. Metaline nails are used:
a) To fasten frames together.
b) To tack on leather gimp.
c) To nail burlap.

9. Hair for upholstery work is curled:
a) To make it springy.
b) It is easier to work with.
c) To make it cheaper.

10. Moss is treated:
a) To remove the outer green coating around it.
b) To make it curly.
c) To remove the odor.

11. Tow packs easily, therefore it should be used:
a) Where a soft job is desired.
b) In cushions.
c) Where a hard job is desired.

12. Flax is not grown in this country for its linen because:
a) It does not grow long enough.
b) It involves too much hand labor.
c) There is not enough of it used here.

13. Cotton felt is made into rolls for upholstery work from:
a) The cotton that has fallen to the ground.
b) Cotton linters, which are by-products from the gin.
c) Old cotton rags.

14. Cotton is grown extensively in the U. S. on account of:
a) The cheap labor in the South.
b) The wet soil in the South.
c) Cheap transportation.

15. Sea grass is imported from:
a) Canada.
b) France.
c) Italy.
d) Mexico.

16. Sea grass is not used very much as:
a) It is not springy enough.
b) It absorbs moisture.
c) It is too expensive.

17. Coconut fiber is a good filler for stuffing as:
a) It is firm and springy.
b) It packs hard.
c) It is cheap.

18. Kapok comes from:
a) Japan.
b) Java.
c) Canada.

19. Kapok grows:
a) On large trees.
b) On bushes.
c) In the sea.

20. Kapok is used in upholstery on boats because:
a) It is cheap.
b) It is light and does not absorb moisture.
c) It packs easily.

21. The best hair for upholstery filling is:
a) Long and curled.
b) Short and straight.

22. Horsehair is imported from:
a) England.
b) France.
c) South America.
d) India.

23. Moss comes from:
a) Spain.
b) Southern United States.
c) Canada.

24. The grades of moss are determined by:
a) Color.
b) Thickness.
c) Weight.

25. Tow is the stalk of:
a) Barley.
b) Rye.
c) Flax.
d) Oats.

26. Grades of tow are determined by the:
a) Color.
b) Thickness.
c) Weight.

27. Excelsior is made of:
a) Straw.
b) Wood.
c) Paper.

28. Grades of excelsior are determined by:
a) Thickness.
b) Color.
c) Weight.

29. Upholstery webbing is made of:
a) Wool.
b) Cotton.
c) Jute fiber.
d) Linen.

30. This raw material is commercially grown in:
a) England.
b) Canada.
c) India.
d) Germany.
e) Africa.

31. A roll of webbing contains:
a) 25 yds.
b) 36 yds.
c) 50 yds.
d) 72 yds.
e) 100 yds.

32. Burlap is made of:
a) Cotton.
b) Jute fiber.
c) Silk.
d) Wool.
e) Linen.

33. Burlap is:
a) 24 in. wide.
b) 36 in. wide.
c) 40 in. wide.
d) 50 in. wide.

34. The grade of burlap is determined by the:
a) Thickness.
b) Weight.
c) Color.
d) Width.

35. A large burlap manufacturing center is in:
a) Mexico.
b) Canada.
c) India.
d) France.

36. Upholstery springs are used in:
a) Seats.
b) Backs.
c) Arms of furniture.

37. Pillow springs are used in:
a) Pillows.
b) Backs.
c) Seats of furniture.

38. The amount of webbing is determined by:
a) The shape of the job.
b) The kind of wood in the job.
c) The size of the opening.

39. Tacks should be staggered in webbing because:
a) It is easier to work.
b) They will not split the frame.
c) The job will look neater.

40. The size of tacks used for webbing will be determined:
a) By the thickness of the webbing.
b) By the kind and thickness of wood.
c) By the amount of springs used in the job.

41. A roll edge is put on a job:
a) To make the job softer.
b) To make a smoother job.
c) To keep the stuffing on the edge of the wood.

42. The width of burlap for a roll edge will be determined:
a) By the shape of the roll.
b) By the size of roll wanted.
c) By the size of the job.

43. Stuffing should be sewn down so as:
a) To make a soft job.
b) It will be easier to put the cover on.
c) Not to get out of place.

44. Stuffing must be picked and spread evenly because:
a) It makes a softer job.
b) There is less waste.
c) It avoids holes and lumps.

45. The first covering over the stuffing should be:
a) Cambric.
b) Muslin.
c) Denim.
46. Covering should be slip tacked because:
a) It makes a better job.
b) It makes a smoother job.
c) It permits the covering to be adjusted to the firmness desired.
47. On seats, coverings such as velour or mohair should be put on so the nap brushes:
a) To the rear.
b) Forward.
c) Sidewise.
48. On backs and arms, coverings such as velour or mohair should be put on so the nap brushes:
a) Toward the top.
b) Downward.
c) Sidewise.
49. Gimp should be matched with the:
a) Quality and color of material.
b) Color of the frame.
c) Style of furniture.
50. Gimp is put on furniture:
a) To make it stronger.
b) To make it more expensive.
c) To cover the tacks used in the covering.

Problems and Projects

TOOLMAKER'S VISE

W. A. DeVette, Erie, Pennsylvania

(See Supplement No. 341)

This is one of a series of drafting problems used by the writer with excellent success.

The toolmaker's vise as a drafting problem was developed mainly for a related problem for machinists. It is, however, a very good problem for use in teaching detail and assembly drawing and part and stock lists.

The use of the handbook and tables for standard parts should be stressed in this problem.

THE USE OF PLASTICS IN THE INDUSTRIAL-ARTS SHOP

A. R. Skomp, Rocky River High School, Rocky River, Ohio

For a long while, chemists failed to realize the importance of certain waste materials which were produced in the organic-chemical laboratories. These materials were of a non-crystalline nature. Only a few workers saw their artificial or synthetic possibilities. However, many did notice some similarity between these undesirable products and natural resins such as amber, shellac, copal, and rosin. No industrial or commercial development of these materials was made until very recently when Dr. Leo Bakeland realized the commercial value of synthetic resin. Since Dr. Bakeland's venture, many synthetic resins have appeared on the industrial horizon.

Glycerin has produced Glyptal and Rezyl, and in the casein-plastics group, we have Karolith and Galalith. From cellulose have come Celluloid, Lumarith, Pyralin, and Tenite. Plaskon and Beetle are in the urea-plastics field. Vinylite is classed as a polymerized vinyl-esters product; and the phenol-formaldehyde combination has produced several well-known plastics such as, Bakelite, Catalin, Marblette, Durez, and Garalin. The phenol-formaldehyde plastics seem to be attracting the attention of many industrial-arts instructors at the present time.

It was found that by uniting carbolic acid with formaldehyde, under certain conditions, a synthetic resin was produced. From this synthetic resin, thermo-setting plastics are cast containing characteristics definitely favorable to their use in the industrial-arts shop. Furthermore, these characteristics can be fairly well controlled.

One factor which is of prime importance to the art and the industrial-arts instructor is that of color. It was found that ordinary steel or iron affected the color of the finished products, and therefore it became necessary to manufacture these resins in specially lined autoclaves. Only a few common metals were found to be satisfactorily manufactured. By producing plastics in lined autoclaves, the color can be held to predetermined shades. The range of colors which can be produced runs from clear to black, with the colors of the rainbow thrown in for good measure.

Perhaps the most important characteristic to be considered is the ease with which the material may be worked. There are two general practices in producing finished plastic products. One has been to shape them in molds, and the other is to cast and then fabricate the cured plastic. Toothbrush handles, pipe stems, pictures, trays, costume jewelry, radio cabinets, cameras, drawer pulls, lamps, dishes, and many other articles have been molded. It has been suggested that before long, automobile tops will be molded from plastics. An industrial firm in Cleveland, Ohio, employs a large number of laboratory workers whose duty is to broaden the field for the use of plastics. We may soon be wearing plastic clothing and live in plastic houses.

Until a short time ago, school shops, art classes, and school laboratories could not make use of plastics for class projects because of the prohibitive prices for the necessary equipment. Although cast plastics for fabrication may be slightly higher than material for molding, if bought by the pound, the final cost is lower because of the fact that the cast plastic may be worked by the ordinary shop tools and machines. Now that industrial-arts instructors see the possibilities for the use of plastics in the school shop, no doubt, the industry will co-operate in every way to give the shop teacher cast blanks suitable for the student's requirements. Sheets 1 by 2 ft. and ranging in thickness from ⅛ to 1 in. are now made. Cylinders beginning with 1 in. to 4 27/64 in. outside diameter, and even larger may be purchased. Round rods and square rods are cast. These run from 5/16 to 1½ and 2 in., and even larger.

One of the more popular blanks is designed for making finger rings. This stock is cast in lengths of about 6 in. In general shape, it is cylindrical with a double thickness on one side to give sufficient material for any design which may strike the student's fancy.

Some of the early plastics which found their way into the industrial-arts shop were not suitable to be worked with the ordinary equipment. They were not made to be reworked. Plastics now designed for fabrication in the school shop can be sawed, filed, turned, lathed, and drilled without any gumming whatsoever.

An instructor who contemplates introducing this material would do well to start with the ring stock. It can be purchased for about 13 cents per stick. A stick may be sawed into 8 or 9 rings. The popular colors are tortoise shell, onyx, black, blue, cherry red, wine, and green quartz. A few may choose porcelain, pink, or yellow.

Ring making will soon add a zest to the shop program. Even parents take up ring making with alacrity, and send orders to the school shop for ring stock.

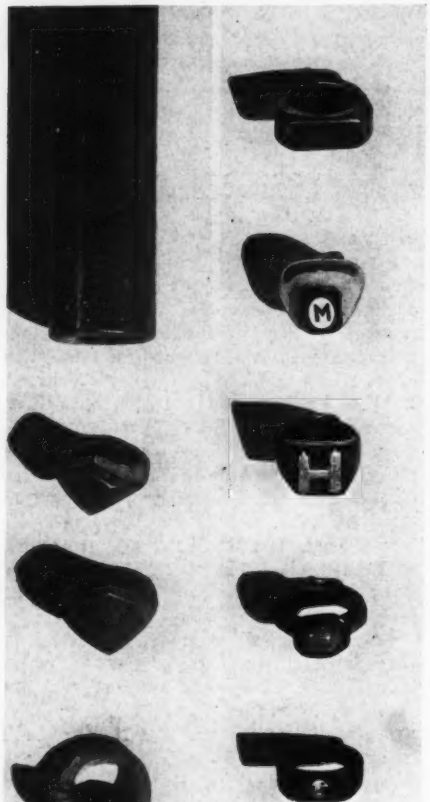
Beginners will do well to start with simple designs. Circles, ellipses, ovals, oblongs, diamonds, and squares, work in nicely. Later, simple inserts of other colors may be made. These may be followed with inserts of metal initials and intricate designs. A junior-high-school girl inserted a white enameled baby tooth into a black ring. The result was a neat, odd, attractive ring.

The following tools will suffice for the beginner: A small 3-cornered metal file, a small flat metal file, a small round file, a metal saw with fine teeth, a small table vise, a sheet of fine emery paper, and some fine pumice stone. These items can be purchased for less than $1.

After a time, a hand drill, or a flexible cable, with a motor and rotary files, burrs, and drills may be added. A buffing wheel and tumbling barrel will make finishing much easier. The tumbling barrel is suggested where there are a large number of small pieces to be finished at one time. By using shoe pegs and dry pumice, good results will be obtained. An enterprising student can easily make a flexible cable from an old auto-speedometer cable. This may be attached to any high-speed motor by using a drill chuck for the connection between the motor and the cable. Rotary files may be made from small broken metal drills.

The ring is begun by sawing out the general shape. Next, the design is worked into it with the metal files. The rough file marks are then taken out with the fine emery paper. The ring

is then ready for polishing. It is rubbed with pumice stone and water. Plenty of water aids in the polishing by preventing the material from heating. Some prefer to use rottenstone, claiming it gives a better finish. Fairly good results are obtained by using cleansing powder for polishing. An exceptionally high polish



A piece of blank ring stock, four steps in making a ring, and examples of rings

may be obtained by using rouge and a buffing wheel.

When inserts of other colors of plastics are used, the openings may be made with a drill or rotary file. Discarded dentist drills and motor would make excellent equipment for cutting plastics. The inserts may be shaped with the hand files.

A satisfactory glue, apparently, has not yet been developed for plastics. Ambroid will do fairly well. There are several metal glues on the market which may be used with good results. One firm selling plastics has a glue which is used with hydrochloric acid. This glue will do good work if it is properly thinned with the acid. Usually not enough acid is used.

Paper knives, book markers, and novelty brooches of various designs may be made from the plastic sheets. Strips cut from the sheets may be bent into lamp projects and the like. Any design which can be applied to wrought iron may be carried out in plastics with the additional advantage of a wide variety of colors.

In bending plastics, the material should be heated in water to about 200 deg. F. A form to hold the piece should first be prepared. The bend may be made by stages as the material quickly hardens when it is removed from the water. However, if it is not held in shape when it is placed back in the water, it will take its original shape. It cannot be bent after the material has cooled. If the bend can be made in the water, the results are much better.

Bracelets, ash trays, cigarette holders, lamp shades, torch lamps, and napkin rings, are a few of the projects which may be made from the cylinders. The cylindrical shapes may easily be worked on the lathe if they are placed tightly on a wood mandrel.

When plastics are worked on the lathe, creditable results may be obtained by using an ordinary firmer chisel which has been ground to the desired shape. This chisel should be ground exceptionally sharp and have plenty of clearance. Lathe tools made from metal files are recommended by some instructors. By moving the tool rest as close to the work as possible, steadiness is assured. The speed of the lathe should be high; although there is danger of heating the material. The cuttings will be fine, long, and curly if the material is worked properly.

The large plastic rods may be turned into stems for small table lamps, and they may be drilled for pipe almost as easily as wood. The live center cannot be forced into the material but a slot may be cut with the backsaw to receive the spurs.

Firms interested in supplying plastics to schools are now working upon designs for blank stock which can be worked into popular projects. Belt-buckle and button-blank stock can now be purchased. Lamp stems, bases, rings, ash trays, etc., are molded into permanent form and are available for the school shop. However, if industry is going too far in this idea of prefabrication, the projects may lose too much of their educational value.

Plastics, if properly used, will do much toward stimulating the industrial-arts program. They may be used in both the fine-arts and industrial-arts fields. Projects made from plastics are permanent, will take a high polish, are easy to work, and come in a large range of colors.

MATERIAL BILL

George H. Carroll and Alvin W. Westerhouse, South Junior High School, Joplin, Missouri

The material bill shown herewith is filled in by the student prior to starting on the project. He is held responsible for keeping the material bill while he is working at the project. Upon completion of the work, the bill of material is presented to the instructor who places upon it the grade earned by the project, after which it is placed on file. In this way, there always is a complete record of all work accomplished by the student.

Name_____ Classification

Project_____ Grade_____

Kind of wood_____ Meets____ and____

Part	No. pcs.	Size	Board Feet
		x x	
		x x	
		x x	
		x x	
		x x	
		x x	
		x x	
		x x	
Total board feet			

Hours____ and____

Bench No._____

Examined by_____ Teacher

Grade on project_____

Save for exhibit_____

@___¢ per ft.

Cost of wood $____

Cost of finish $____

Cost of fixtures $____

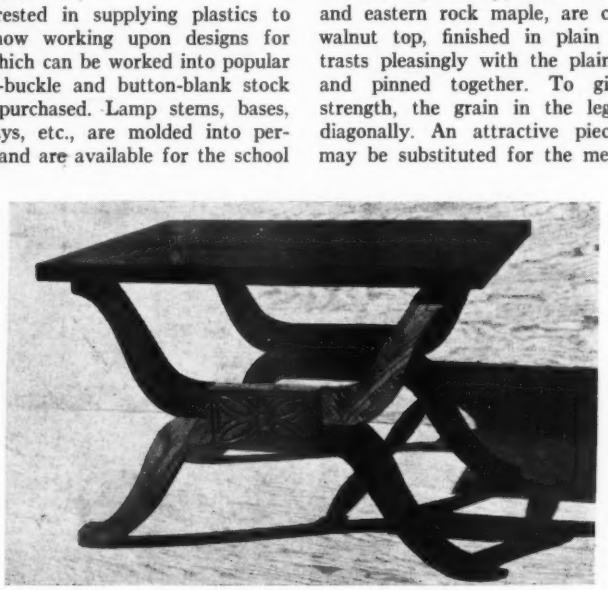
Total . . . . . $____

References read:

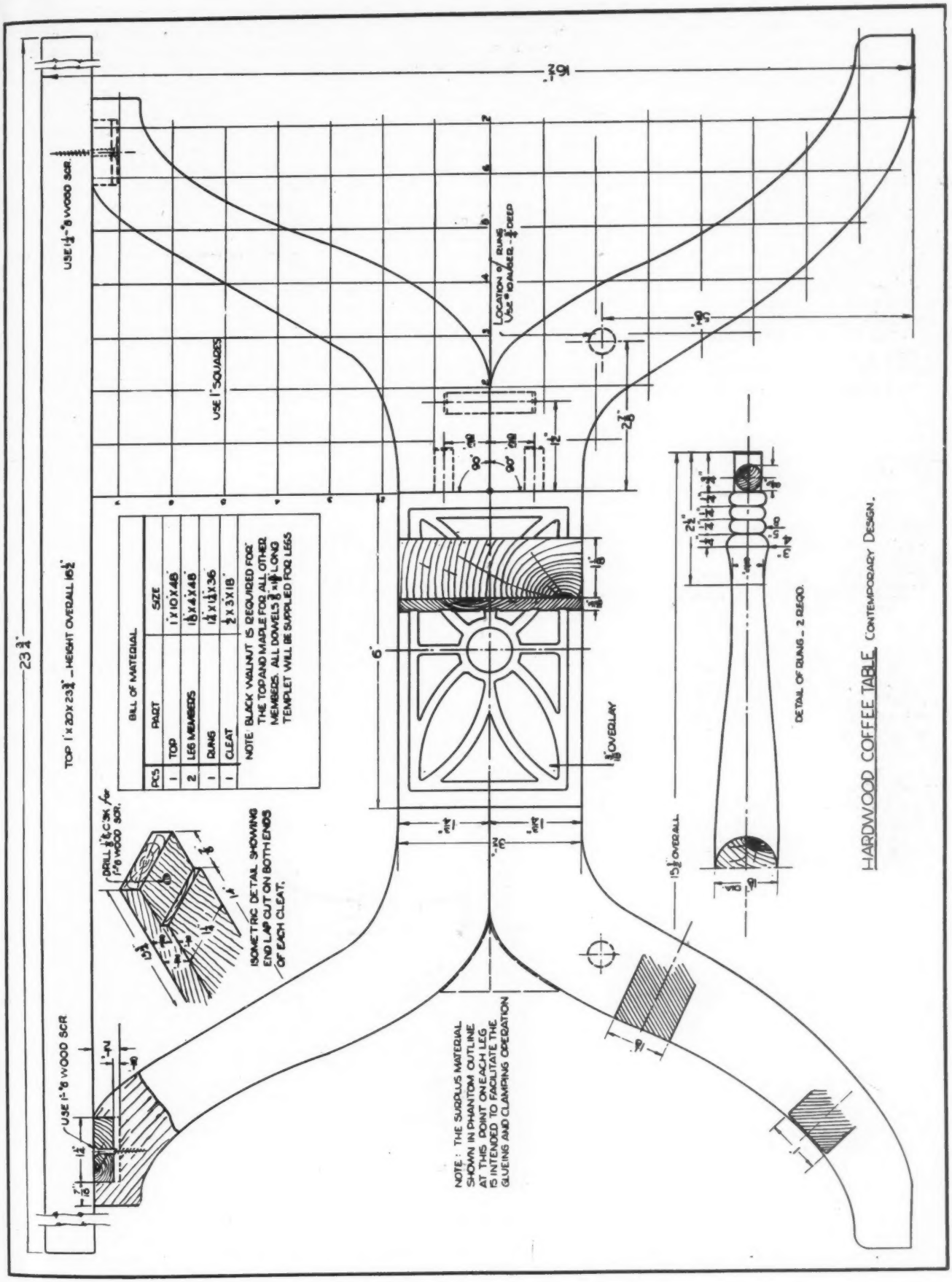
HARDWOOD COFFEE TABLE

W. S. Sherinyan, Benjamin Franklin High School, Los Angeles, California

In this particular coffee table, the use of two woods; namely, black American walnut and eastern rock maple, are combined. The walnut top, finished in plain lacquer, contrasts pleasingly with the plain legs, jointed and pinned together. To give maximum strength, the grain in the legs should run diagonally. An attractive piece of overlay may be substituted for the member showing the carved design.



The variety of operations makes this piece valuable as a second-year high-school project. Instructional values such as jointing, boring, clamping, band sawing, wood turning, hand carving, and, lastly, an unsual study of blue-


HARDWOOD COFFEE TABLE CONTEMPORARY DESIGN.
BILL OF MATERIAL
PCS | PART | SIZE
1 | TOP | 1"X10"X48"
2 | LEG MEMBERS | 1⅜"X4"X48"
1 | RUNG | 1¼"X1¼"X36"
1 | CLEAT | ¾"X3"X18"
NOTE: BLACK WALNUT IS REQUIRED FOR THE TOP AND MAPLE FOR ALL OTHER MEMBERS. ALL DOWELS ⅜" DIA. LONG TEMPLET WILL BE SUPPLIED FOR LEGS
TOP 1"X20"X23¾" - HEIGHT OVERALL 16½"
USE ¼"-8 WOOD SCR.
USE 1" SQUARES
LOCATION OF RUNS USE ¼" DOWEL - ½" DEEP
DETAIL OF RUNS - 2 REQD.
OVERLAY
ISOMETRIC DETAIL SHOWING END LAP CUT ON BOTH ENDS OF EACH CLEAT.
NOTE: THE SURPLUS MATERIAL SHOWN IN PHANTOM OUTLINE AT THIS POINT ON EACH LEG IS INTENDED TO FACILITATE THE GLUEING AND CLAMPING OPERATION

print reading justify this standard-size table as a "contemporary" example of furniture design. The cost of material does not exceed $3.

SILHOUETTE PLANT HOLDER

S. H. Puehler, Public Schools, Milwaukee, Wisconsin

A bit of cheer may be added to the atmosphere of the household by brightening up a dark corner with the plant holder described herein. Of course, some kind of graceful plant is also necessary to complete the picture.

The pattern chosen is traced onto a piece of sheet metal. The silhouette is then cut out with a tinner's snips and with a metal coping saw, after which it is filed to the line.

The ¼-in. rod is forged, split, shaped, and holes drilled for the insertion of the silhouette, wires, and rivets.

The back is made of two pieces of contrasting metal such as brass or copper sweated onto a piece of 16-gauge black iron.

The various parts are fastened together and the silhouette painted black.

The bucket material is cut, and the joint soldered together, after which the bottom is made to fit and soldered in place. The bucket is hung from the plant holder with three short pieces of brass chain. Preserve the finish with a coating of lacquer, varnish, or wax.

OUTDOOR FIREPLACE OF CONCRETE

Leon H. Baxter, Director of Handwork, The Pawling School, Pawling, New York

Steak roasts and outdoor picnics form quite an interesting phase of the social life of the boys of the Pawling School at Pawling, N. Y. In the past, a simple trench was dug in the ground and a strip of poultry wire placed over the hot embers.

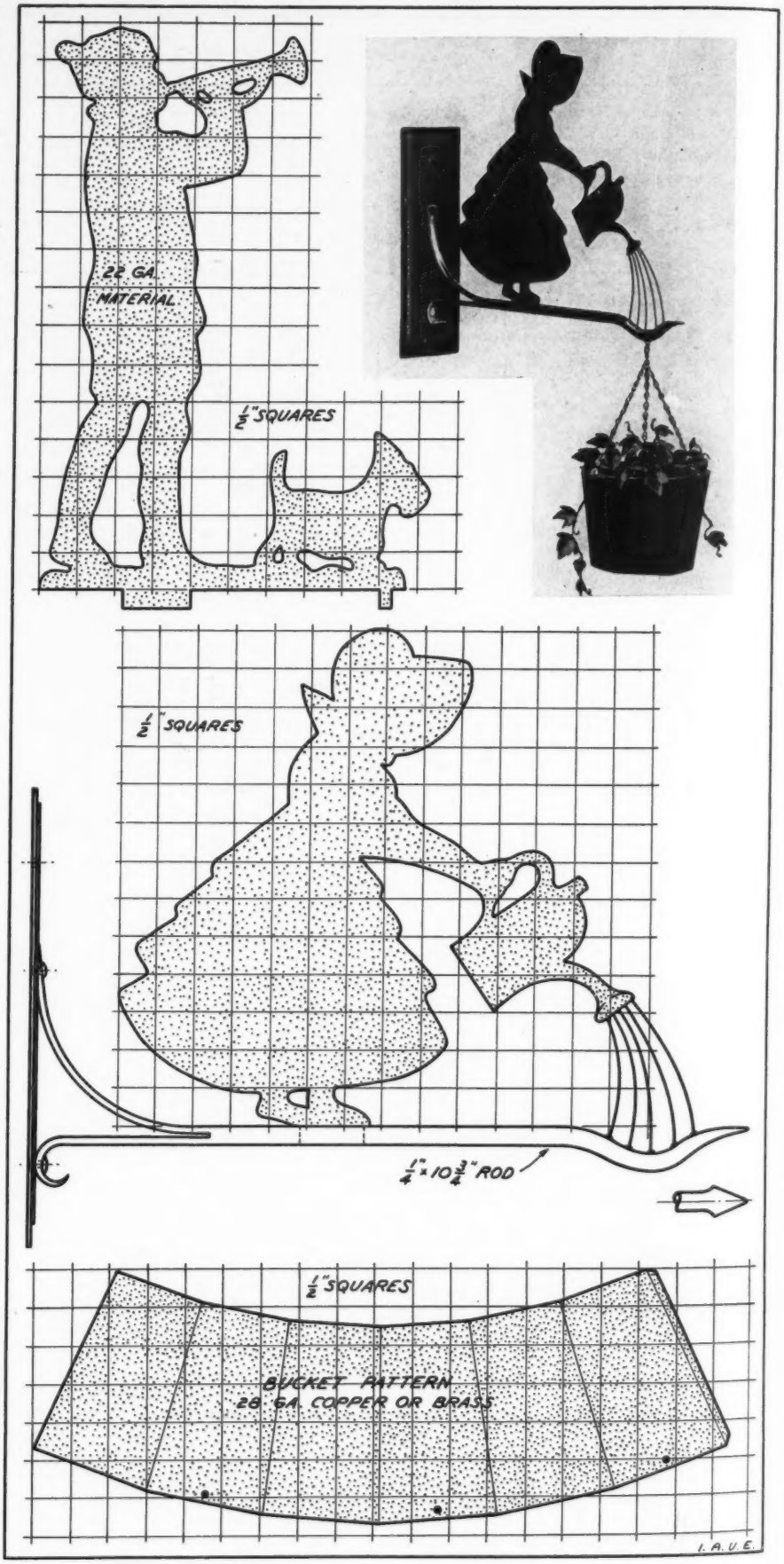
This was a back breaking and not altogether sanitary method of procedure, and so a group of the younger boys, none over 13 years, agreed to construct a permanent type of fireplace which would be both practical and ornamental. This was taken up as a class problem and work was started.

The fireplace was made of a size to accommodate at least five dozen steaks. Fireplaces of this type, but smaller in size, could be made, using similar methods of construction.

A trench about 8 in. deep, 36 in. wide, and 9 ft. 6 in. long was excavated. In the bottom of this was placed about 3 in. of cinders, although slag or coarse gravel could be used. This was wet and tamped down firmly. On top of this about 5 in. of concrete was laid and tamped into place, using a 1-2½-4 mixture (one part cement, 2½ parts sand, and 4 parts gravel).

The sand and cement were carefully measured out and thoroughly mixed dry. The mixture was then piled up volcano shape, and a hole was opened at the top. This was then filled with clean water, and the cement and sand were worked up from the sides toward the top until all the moisture was absorbed.

The pile was then flattened down and the remainder of the water was applied with a



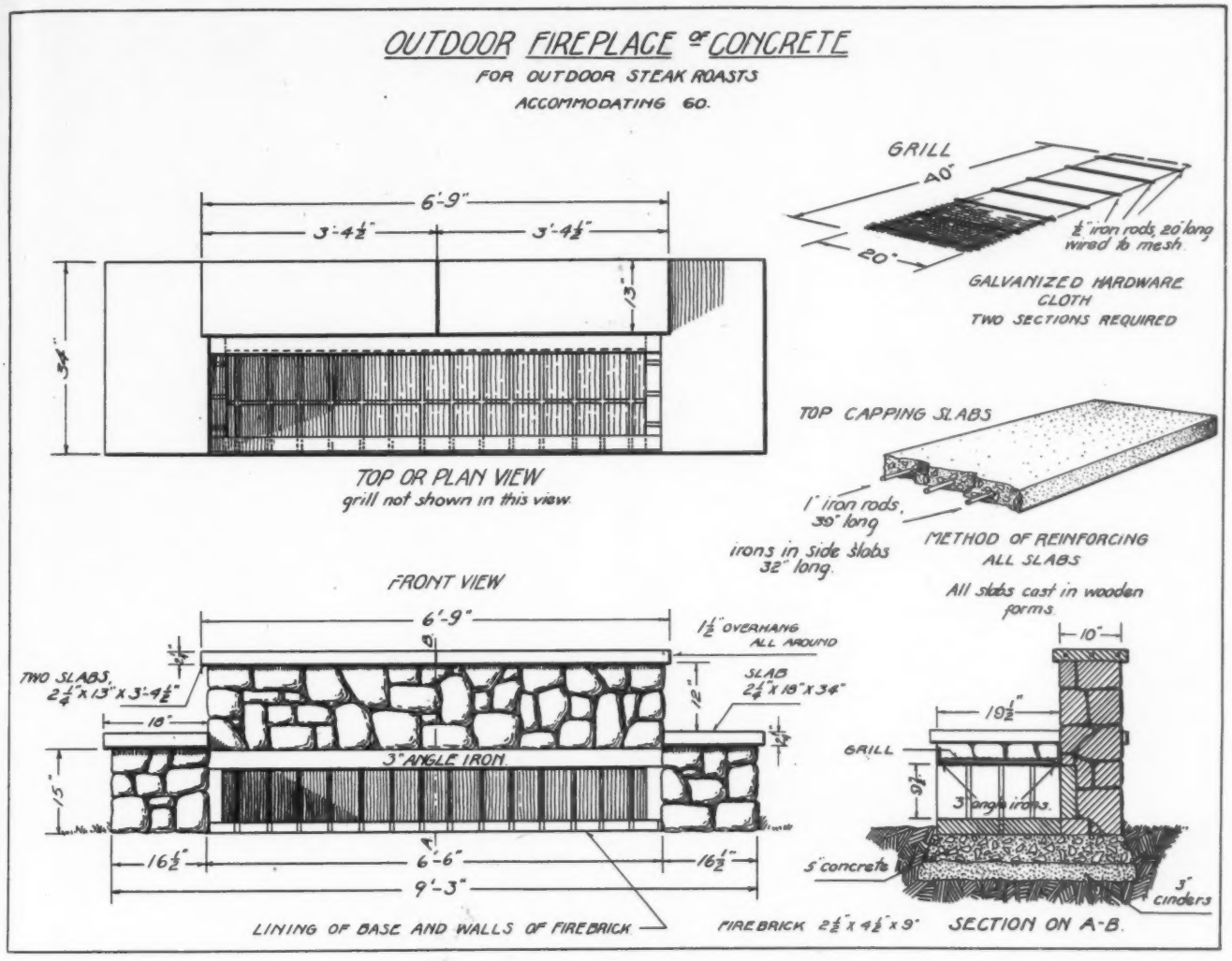


Fig. 1. Details of the concrete fireplace

sprinkling can, turning the batch over thoroughly with a square-nosed shovel until the cement was of a uniform quakey consistency. Next, the gravel, which should vary in size up to about the size of an egg, was moistened, after which it was worked into the first mixture until all parts were thoroughly coated. This was then placed on top of the cinders and tamped firmly in place, so that the surface was level.

The cinder, or sub-base, permits all moisture to drain from about the foundation and thus prevents freezing and heaving.

A firebrick base, two rows of fifteen bricks each, was next placed. These bricks were 2½ by 4½ by 9 in., and a cement-mortar joint, ¾ in. wide, was allowed between each brick. The cement mortar was made of two parts sand and one part cement mixed to an even plastic consistency, and placed and pointed up with a trowel. While laying the base, it is necessary constantly to test with a level for accuracy.

The bricks were set upright on their ends at the back and two ends of the fireplace. Here, too, the joint of cement mortar between bricks was made ¾ in.

Two angle irons, 3 in. on a leg, were placed on top of the brick, one at the rear and one in front, as shown in Figures 1 and 2.

The fireplace ends were then laid with plenty of cement mortar between the stones. These ends are 16½ in. wide, 30½ in. deep and 15 in. high. Care was taken in laying these stones, to break joints in the courses. The larger stones were used at the bottom, and the top filled in with stones of suitable shape to make a pleasing appearance (See Fig. 3). Broken brick and smaller stones were used to fill in behind the exterior facing. Care should be taken to line up the wall with the firebrick and angle irons.

The back wall was made 10 in. thick, and 30 in. high. The upper course of stone was carefully leveled to receive the concrete slab which was placed later.

The joints between stones were all pointed up in a neat manner, and after the joints had dried out for about 2 hours, a neat cement mixture (cement and water mixed to a thin, pasty consistency) was painted over the joints with a 2-in. paint brush. This gave a uniform final polish.

It is a good plan to cast the topping slabs when the wall is first started so as to give them ample time to dry out and season.

The fireplace could be finished without the capping stones shown in Figures 3 and 4, but the author feels that besides adding a neat finish to the job, they also serve admirably as shelves on which food may be placed. The slabs should extend 1½ in. beyond the stonework all around.

We made two frames having an inside dimension of 2¼ by 18 by 34 in. for the side slabs, and two frames 2¼ by 13 by 40½ in. for the top slabs. The frames should be made of ⅞-in. planed lumber screwed together with No. 12 by 1½-in. f.h.b. screws. The forms must be oiled on the inside with any kind of oil to insure nonsticking of the concrete to the sides.

If there is no hurry in completing the job, one frame of each size will be sufficient, using the same frame twice.

When casting the slabs, these forms should be laid on a level platform and a mixture of cement, sand, and gravel not to run over 1½ in. in diameter, should be mixed as follows: First, mix dry one part of cement and two parts of sand. Wet and mix thoroughly as

was done in the case of the foundation mixture.

Measure out three parts of gravel, wet, and add to the previous batch, mixing very thoroughly.

One-inch iron rods are cut 2 in. shorter than the finished slabs. These are used to reinforce the slabs, as shown in Figure 1.

Fill the forms about half full of the concrete mixture, working into the corners and along the edges with a trowel. On this, place the reinforcing rods and complete the filling. Level off all extra concrete with a straight-edged stick. Allow these forms to set about two hours and then finish the top surface with a smoothing device made of a piece of wood ⅞ by 4 by 7 in., over which a piece of old carpeting has been fastened. Turn the carpet over the edges of the wood and fasten with 6-oz. tacks. Attach a simple handle and use the board like a trowel, bearing on lightly and uniformly and smoothing over the surface of the concrete. This will give the surface a uniform finish much more pleasing than the finish given by a metal trowel.

Allow the concrete to set and dry for about two days, wetting the slab each morning to insure an even drying out.

Remove from the forms by taking out the screws and slide the casting to the edge of the platform.

With someone's help, raise the slab and set in place. A bed of cement mortar should have previously been laid to receive the slab. Carefully true up with a level in both directions, as shown in Figure 2, and bed firmly in place and point up around the edges with a trowel. Brush over the joints with neat cement as before.

Clean away all extra concrete and grade neatly around the fireplace.

Do not use the fireplace for at least a week after the last cement has been laid.

While the fireplace is drying out, make the grill which fits in between the angle irons as shown in the section drawing. This should be made in two sections so that it may be removed for cleaning.

To fit this particular fireplace, cut 14 pieces of ½-in. iron rod, 20 in. long, and two pieces of galvanized hardware cloth 20 by 40 in. Using ordinary soft iron wire, attach each rod to the galvanized mesh at four places (See Fig. 1).

These rods should be so located as to have about a 1½-in. space between the ends of each section of wire mesh and the end rods.

This is to allow the two sections to overlap slightly. Place the completed sections on the angle irons and bring on the steaks.

FIRES

W. Ben. Hunt, Hales Corners, Wisconsin

The plate on fires, on page 199, will be of special interest to camp leaders, scout leaders, hiking-club sponsors, and others interested in Indian lore.

Under certain conditions, it may be difficult for the boys involved, to experiment with the

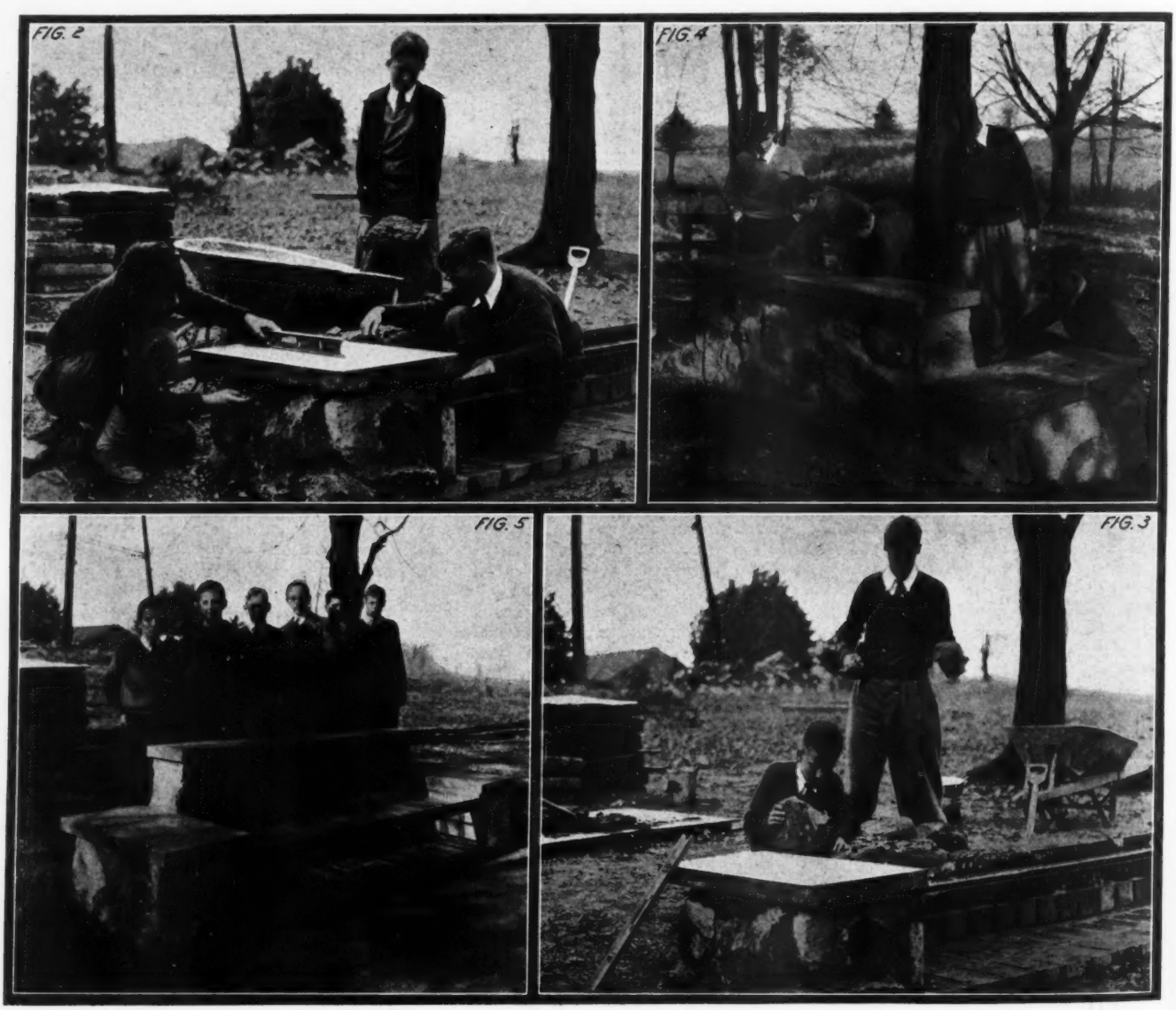
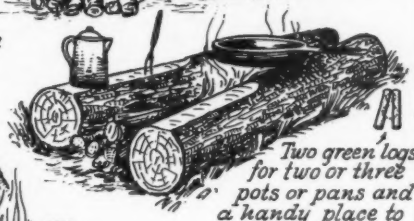


Fig. 2. O.K. She's level. Fig. 3. We'll build the back next. Fig. 4. Almost ready. Fig. 5. Bring on your steaks

A green backlog fire for broiling or frying.



Two green logs for two or three pots or pans and a handy place to set things.

A three log fire as used by Seminole Indians. As the ends burn away, the logs are pushed towards the center.

A simple pole crane. The end of the pole may be pointed and pushed or driven into the ground.

A simple pot-hook.

A three stone fire. See that pan rests evenly before starting fire.

FIRES

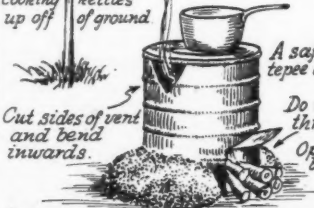
BY W. BEN. HUNT, HALES CORNERS, WIS.

A two stone fire can be used for more than one kettle or pan.

A one stone fire. See that pot rests evenly & firmly.

Always cooking up off ground

hang kettles



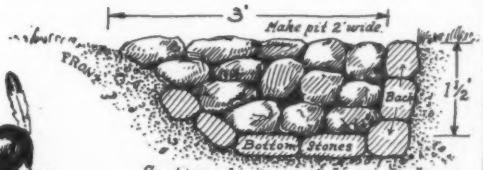
A dandy stove can be made from an old powder can or galvanized pail. Clay banked around the base helps to hold the heat.

Three or four ½ inch square iron rods laid across logs or stones make an ideal camp grate.

Clean sooty kettles with gritty mud or sand and water.

Iron rods across a hole scooped out of a clay bank.

Two good old methods.

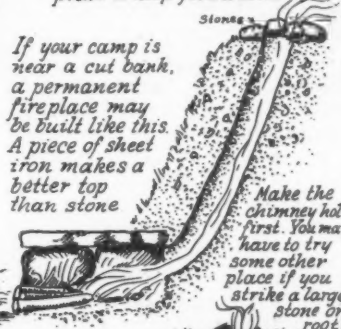


Sectional view of bean-hole or corn pit, faced with stones to hold the heat. A sloping front facilitates the removal of ashes.

A thin flat stone supported by stones, with a small fire under it makes an excellent warming plate to keep food warm.

- **Don't** build fires close to live trees. It may injure or kill them.
- **Don't** build fires against dead trees or logs. It may start a fire that you can't put out.
- **Don't** have dry grass or rubbish near a fire. It may start a grass or forest fire.
- **Don't** leave a fire unattended. Always put it out when you go away.
- **Don't** try to build a fire with green wood. After a rain, remember that "high wood is dry wood."
- **Don't** carry loose matches in your pockets. Keep them in a small bottle well corked or in a waterproof match safe. Dry matches are worth more to you in wet weather than in dry weather.
- **Don't** build a large fire for cooking, unless it's to get embers to bake beans or roast corn.

And Remember—soft wood and small branches for a quick fire & hardwood and knots for a hot fire.



If your camp is near a cut bank, a permanent fireplace may be built like this. A piece of sheet iron makes a better top than stone

Make the chimney hole first. You may have to try some other place if you strike a large stone or root.

Place stones around top of chimney.

Miniature campfires arranged on a 2 ft. square of celotex

actual fires shown. They can, however, derive benefit, obtain pleasure, develop vicarious interest in outdoor life, and find excellent occupation for some spare hours by making a miniature display panel, like the one shown in the illustration, in which the various types of fires are illustrated. Not the least interesting part of the job of making such a panel is the production of the miniature pots, pans, and kettles and in getting together the various things necessary to make the panel thoroughly illustrative.

The display panel shown was made by a number of boy scouts for one of their exhibits. It called forth considerable favorable comment. The miniature logs were obtained on a hike through the woods, the utensils were painstakingly made to scale, and the figure of the Indian, shown at one of the fires, was contributed by one of the boys who salvaged it from an old discarded incense-burner set.

A HANDY ANVIL FOR THE SMALL WORKBENCH

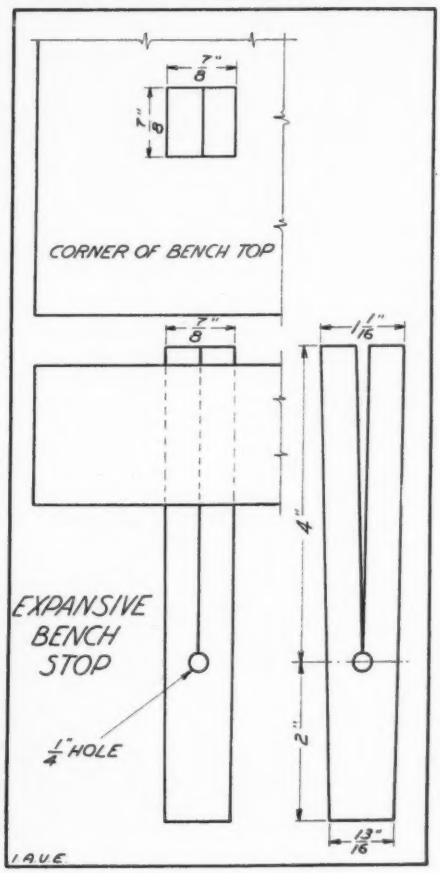
Frank Bentley, Clinton, Iowa

Many pieces of work in the small manual-training room or the home shop require a small pounding block or anvil. Such a piece of iron, to meet all requirements, is at times a hard thing to locate or make. However, the sole plate or bottom of an old electric flat iron is very acceptable for this kind of work. Due to its tapering edge, it is easily picked up with the fingers. It is neither too large nor too small, and it takes up little or no room in the small tool drawer below the bench top. Such old plates are readily procured from any electric shop where old irons are continually turned in on exchange for newer types. The metal of the plates is just hard enough to be suitable for a block of this kind.

EXPANSIVE BENCH STOP

Stirling P. Hanna, Elementary School, Esquimalt, B. C., Canada

The expansive stop described herewith is made of a piece of hardwood. It is made wider at the top than at the bottom. The V-shaped cut down the side, however, permits it to contract so that it can be pushed into the mortise cut into the bench top at which time the sides of the bench stop are compressed so that it will be held firmly at whatever height described above the bench top. When not in use, it may be pushed down level with the bench top to be raised quickly again when it is needed.

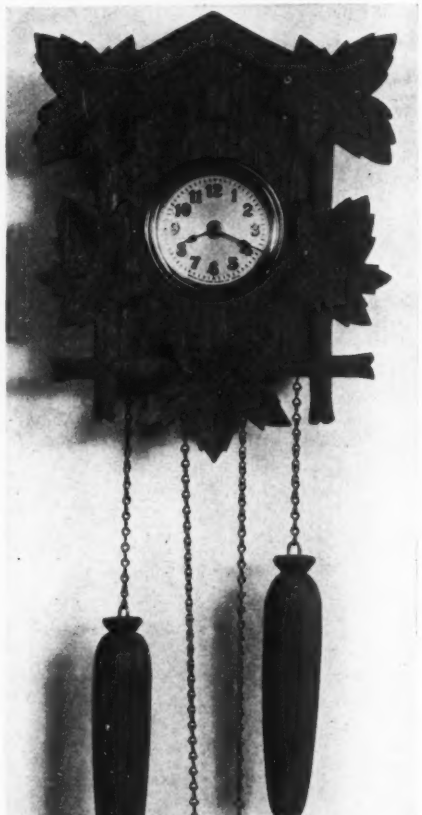


A CUCKOO-CLOCK FRAME

Edmund C. Flynn, San Jose, California

The cuckoo-clock frame herein described is an excellent shop project. It holds the interest of the student; it has utilitarian value, and it offers just enough difficulty to make it thoroughly worth while as a shop problem.

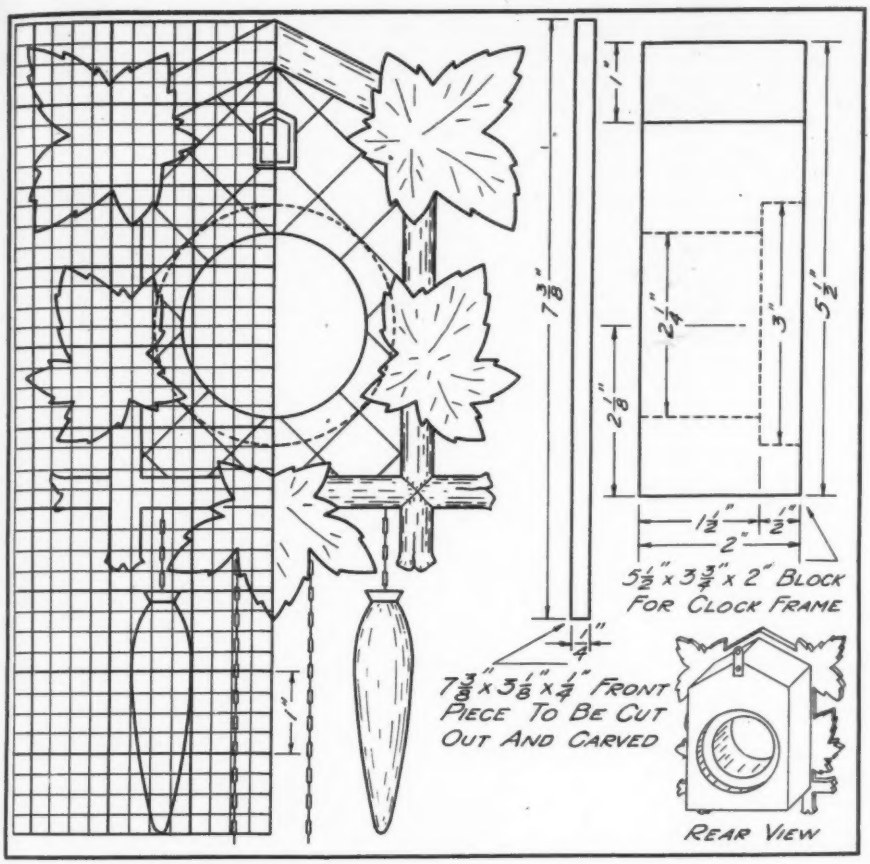
Any one of several woods can be used in its construction but best results can be obtained by using walnut or mahogany. These two woods are easy to work and take a suitable finish.



Construction

The clock frame is composed of two pieces — the front piece and the frame proper. The front is made of a piece of wood ¼ by 3⅛ by 7⅜ in. It is best to cut out the inside with a coping saw first, and then the outside. The leaves can then be carved and veined. The side and bottom pieces are slightly rounded to give the effect of logs. The top piece is flat but is cut down with a chisel about 1/16 in. lower than the top plane of the leaves. The front is then ready to be glued to the clock frame.

The block in which the clock is mounted



is made from a piece of wood 2 by 3¾ by 5½. A 2¼-in. hole is bored in the front on the center line, 2⅛ in. from the bottom. This hole is just 1½ in. deep. From the rear a 3-in. hole is bored ½ in. deep, in line with the one on the front. This makes a recess for the winding key and permits the frame to rest flatly against the wall. The holes can be bored with an expansive bit. If desired, fine diagonal grooves can be carved across the front which adds a bit of interest. Also a small piece ½ by ¾ in. can be glued above the clock to resemble a door.

The cones are turned on a lathe and are suspended from the frame on fine brass chains, preferably of the log-chain type. About 6 ft. of chain altogether will give the right effect.

The device to hang the clock should be mounted on the back of the frame before gluing on the front piece. When the woodwork is completed, stain the entire piece with a light brown stain.

A clock of the correct size to mount in the frame can be procured from any one of several clock manufacturers.

ELECTRIC BAIT GATHERER

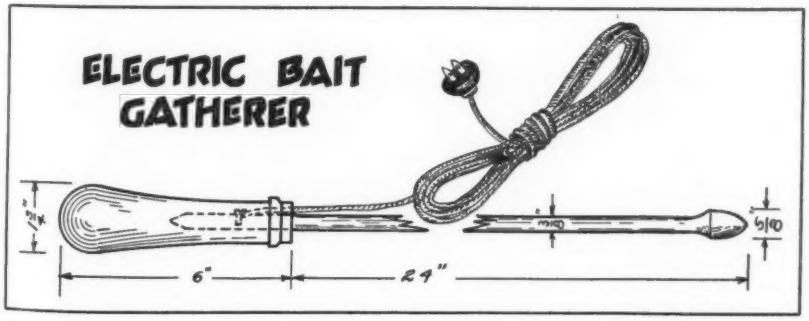
L. F. Hyatt, Canton, Ohio

The fishing season is again at hand. These trips necessitate the gathering of bait — a difficult job when the ground is so dry that the worms burrow deeply.

The accompanying illustration of the electric bait gatherer is practically self-explanatory. The end of the 24-in. rod is pointed so it can be more easily forced into the ground. The other end of the rod must be squared or otherwise fastened in the handle so it will not turn, and be fitted with a setscrew for the purpose of fastening the wire securely to this rod. The handle should be large enough to afford a good grip. *A single wire only* is to be used and it is to be fastened to one of the prongs of the plug. The prong is, of course, inserted into the live side of the plug base. The earth should be wet for a couple of days previous to using this instrument, to facilitate the flow of electricity through the ground. The rod is forced as far as possible into the earth and the current turned on. Like magic the bait will come scurrying out on top of the ground.

The front lawn is a splendid place to get bait and no damage is done to the lawn. This is a very good project for general shop, electric shop, home work shop, and even the woodwork shop.

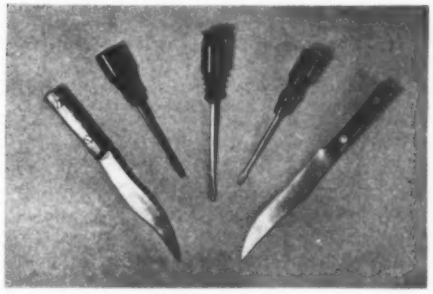
CAUTION: Do not let your hands or any portion of your body touch the metal rod after it has been connected with the electric socket.



NEW SCREW DRIVER AND KNIFE HANDLES

George W. Haas, Instructor, Public Schools, Lakefield, Minnesota

The accompanying illustration shows handles made of a plastic named "pyralin." This is a cellulose acetate plastic of amber color, although other colors are available. This material may be planed, sawed, or turned in on the lathe. It is resilient, tough,



and hard, and can be easily polished with a cloth moistened with alcohol.

The screw-driver shanks were made of ¼-in. round stock, and threaded for a distance of about 1½ in. The end of the shank was then ground to a slight taper, and the pyralin handle turned on, the shank cutting its own threads in the pyralin. A 3/16-in. hole had been drilled in the pyralin, thus making a tight fit. The hole in the handle should be drilled about ¼ in. deeper than the length of the threads. This permits a tighter fit. The friction caused by turning on the handles produces sufficient heat to soften the pyralin somewhat. After the handle has been turned on, and left for a while, the pyralin solidifies and makes a very tight-fitting handle.

Alcohol also may be used in putting on handles. In this method, proceed as before, except that after the handles are turned on nearly all of the way, they are to be taken off again, after which alcohol is poured into the hole in the handle. The shank is then immediately turned into the handle, and left to dry for a day. The alcohol softens the pyralin, but after it has evaporated, the handle

is not only very tight, but it is also perfectly transparent. When the handles are put on dry, an unsightly white core is often left around the threads. The alcohol dissolves this.

Even if the alcohol so softens the pyralin that the threads strip when the handle is turned on, the handle may be driven on with a mallet. Then when the softened pyralin hardens about the shank, it will be found that the joint is very tight.

We have made a considerable number of these handles, and we have yet to have one of them come loose. Probably a square shank driven into a round hole filled with alcohol might also produce a strong joint, although we have not tried this out and hence cannot make any claims for it.

AN EMPIRE FOOTSTOOL

Deane E. Eldridge, Director of Industrial Arts, Plymouth, Massachusetts

The empire footstool illustrated is well within the boy's ability to make. It is easily constructed and yet embodies many instructional units. While this footstool does not contain many of the Napoleonic details and decorative motifs, however, the concavely curved legs place it immediately in this class as does the suggested swan-neck curve on the top section of each leg. The expense of this project is small, and as it teaches the making of curved parts, forming of duplicate pieces, careful joinery, wood turning, and simple upholstery, it is well worth considering as a class or individual project.

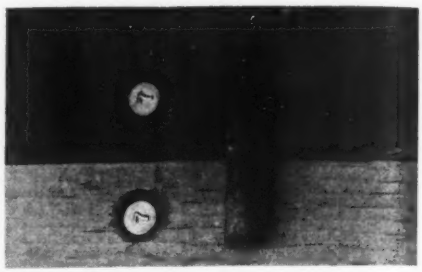
TO PREVENT NUMBER TACKS FROM LOOSENING

Frank Bentley, Clinton, Iowa

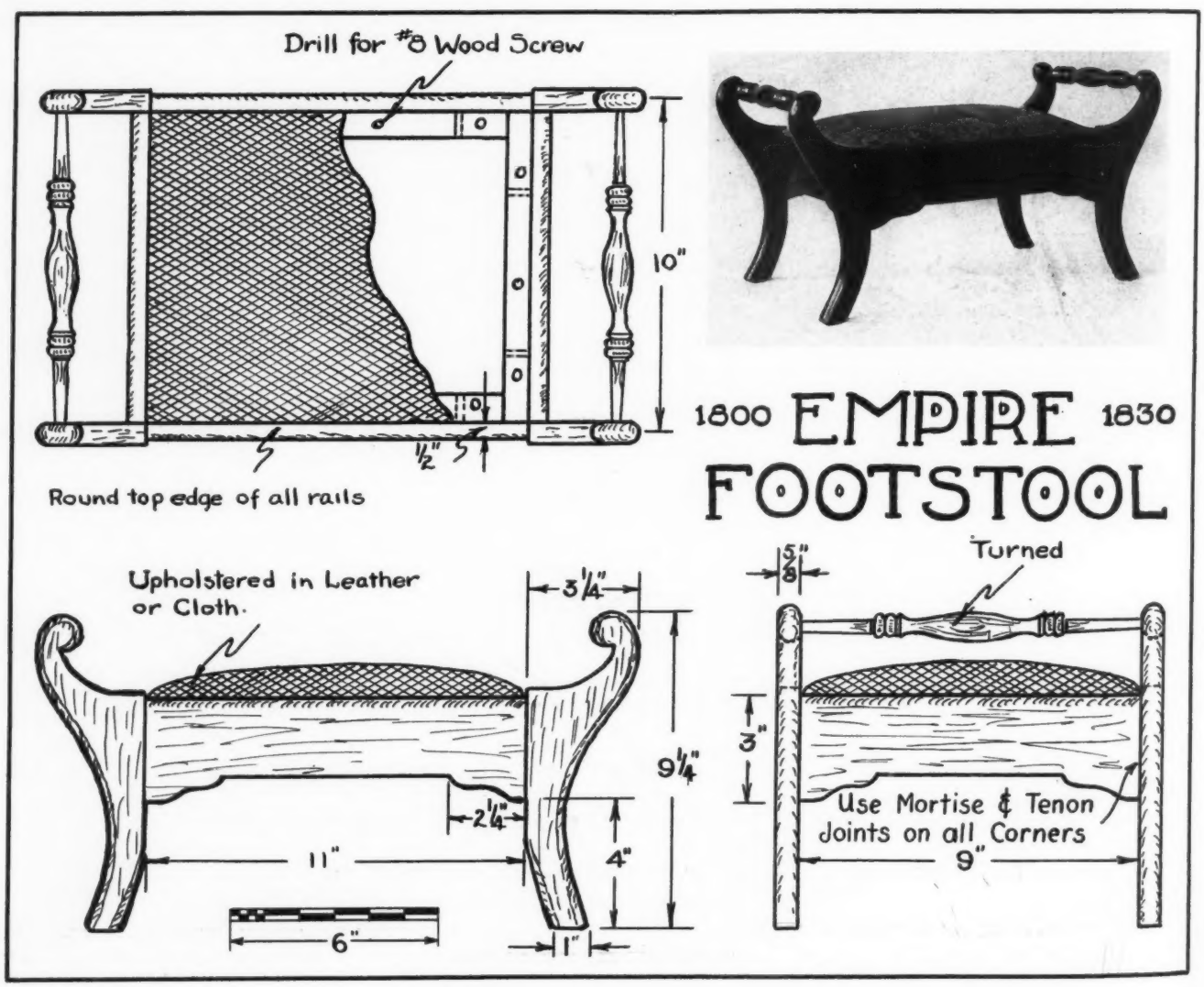
Number tacks used on storm windows, screens, and other removable pieces to identify them are often hard to locate in places where they will not be disturbed, and eventually lost due to the short points working loose in the soft wood into which they are necessarily forced.

Take a piece of round iron, at least a foot long and of a diameter slightly larger than the head of the number tack. Heat until it is red and quickly burn a hole in the wood to a depth slightly greater than the thickness of the tack head. This quick application of the hot iron will not deface the area around the recess. Next, force the tack head into this countersunk cavity.

It may then be painted, the film of paint around the edges tending further to seal it in.



The point of a knife blade can be used to clean the numeral if illegible. In this manner, the tacks are protected from contact with anything which would tend to loosen them, and their installation is a permanent one.



WINDMILL MADE FROM TWO TIN CANS

Jos. J. Lukowitz, Milwaukee, Wisconsin

Young boys quickly become interested in the tin can when they are shown that they can make animated toys and articles of practical use out of it. Since the tin can is a potential source of much free material, it is admirably suitable for developing the boys' originality and resourcefulness.

Figure 1 shows a very simple toy made from two tin cans. The base is a low, 3 ⅜-in. diameter can. Of course, cans of other sizes and proportions also may be used. The vane

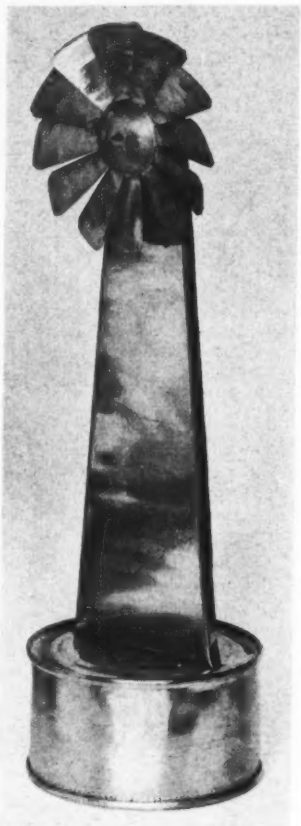


Fig. 1

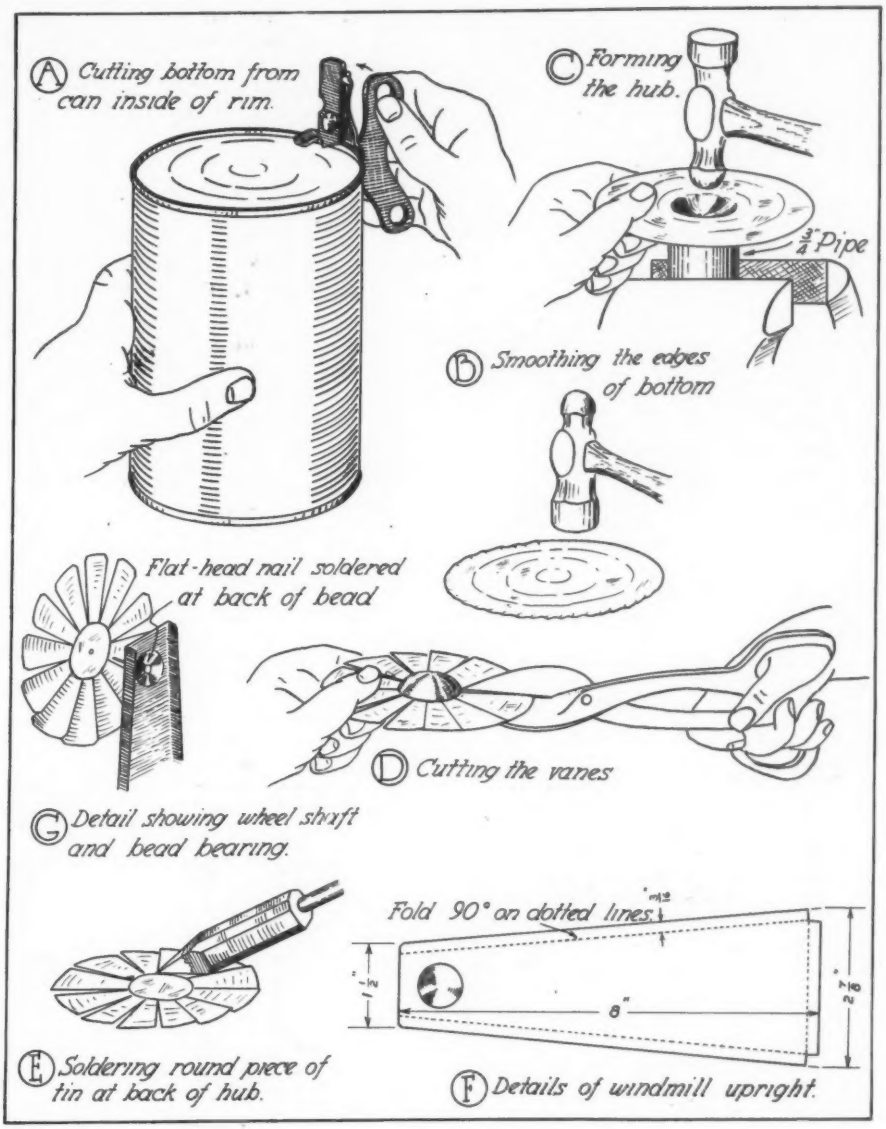

A Cutting bottom from can inside of rim.
C Forming the hub.
¾" Pipe
B Smoothing the edges of bottom
Flat-head nail soldered at back of head
D Cutting the vanes
G Detail showing wheel shaft and head bearing.
Fold 90° on dotted lines.
½"
1½"
8"
2⅛"
E Soldering round piece of tin at back of hub.
F Details of windmill upright.

Fig. 2

or wheel, and the upright are made from a 3 ⅜ by 4½-in. can. The bottom of the can is used for the vane. It may be cut from the can with the type of can opener shown at A in Figure 2. When the bottom is cut out, tap it lightly with a hammer as shown at B in

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FORESIGHT

Foresight is the comprehending of a future outcome. It is involved in the working out of objectives and is the worker's guide in turning out a finished product.

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Submitted by Professor L. M. Roehl, Cornell University, Ithaca, New York

Figure 2 to remove the scallops at the edge and the concentric circles pressed into its surface. Next, form the hub in the wheel as shown at C in Figure 2. Beat the hub to a depth of at least ⅜ in. After it has been beaten out, punch a hole at the exact center of the hub with a nail. Then lay out the vanes and cut them with tin snips as shown at D in Figure 2. Cut a circular disk of tin as large as the diameter of the hub and solder it to the back of the hub as shown at E in Figure 2. Now, turn the wheel over and insert the nail in the hole previously punched in the hub and punch a hole through the piece of tin just soldered to the back of the hub. Be sure to hold the nail at right angles to the flat back of the hub. File off the slight burr left by punching the hole, and then bend the vanes to shape with the fingers.

The windmill upright is cut from the side of the can from which the bottom was removed. To do this, cut through the can about ½ in. to one side of the longitudinal seam. Do not attempt to flatten it out until the two rolled rims have been cut off with tin snips. The details of the windmill upright are given at F in Figure 2. The 3/16-in. folds on the upright may be made by clamping the tin between two pieces of wood, and lightly hammering the tin to shape with a wooden mallet. A much quicker and more accurate method of making such folds in tin is to use a home-made folding device such as is described on page 19, in *55 New Tin-Can Projects*.* The bead or bearing at the top of the upright is formed as shown at C in Figure 2. Use a piece of ½-in. pipe into which to hammer the bead.

At G in Figure 2 is shown the shaft for the wheel which is soldered to the inside of the bearing bead and the relation of the wheel to the bead and shaft.

When soldering the upright to the can which forms the base, be sure to solder the corners well so as to make the upright rigid.

After the windmill has been assembled, it is ready for the finish. Lacquer or enamel may be used for this. The color combination, of course, may be chosen to suit the taste of the student who has made the windmill.

*Published by The Bruce Publishing Co., Milwaukee, Wisconsin.

AN EFFICIENT FIREPLACE

R. H. Jenkins, Associate Professor Industrial Education, Humboldt State Teachers College, Arcata, California

Some years ago the writer became interested in the subject of fireplaces, and made a careful study of the problems involved in their construction. It seemed deplorable that such a desirable feature of the home should so frequently be only ornamental, and not efficient. Contractors were interviewed, and sketches made of their different designs. Finally, a man was consulted whose family line has for generations built excellent fireplaces, and from him a plan was obtained which stood the test of logic and proved efficient in every case. The writer has built, and has had built, fireplaces from this design, and the results have been uniformly satisfactory.

There are two general problems involved in building a fireplace: the first, that it shall draw and not smoke; and the second, that it shall throw out a maximum amount of heat. The draft lies in the shape of the throat and chimney, and the heating in the reflecting and radiating quality of the back wall of the fireplace proper.

Figure 1 shows an elevation and section of a desirable fireplace. The throat, leading to the chimney, begins well to the front, in fact, within the thickness of a brick of the front opening. This permits of a generous curve to the back wall, and gives an opportunity for the heat to be carried well into the room. The throat itself is long, but ends at a point where the inside perpendicular line of the front of the chimney begins. Air currents com-

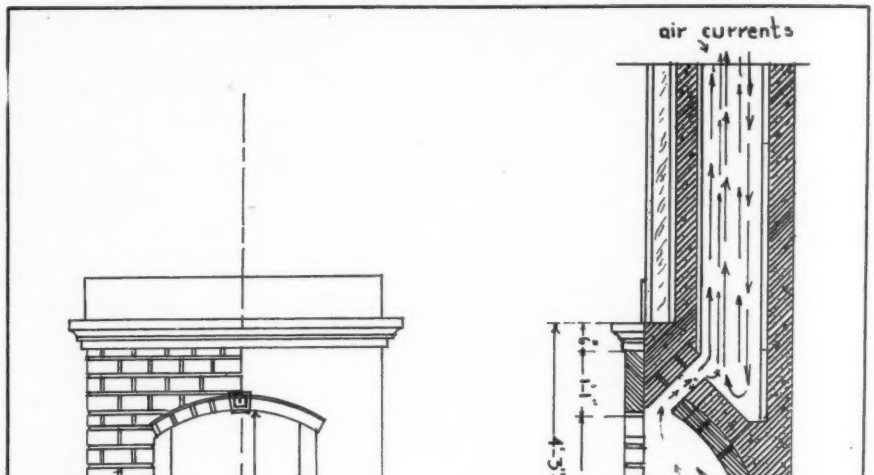

Fig. 1. This type of fireplace has always proved efficient. Due to the shape of its throat and chimney, there is practically no danger of smoking, and the curved back wall gives off the maximum amount of heat

FOR YOUR BULLETIN BOARD

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DETERMINATION

Determination is a characteristic much to be desired. It is the one factor common to all individuals who are successful.

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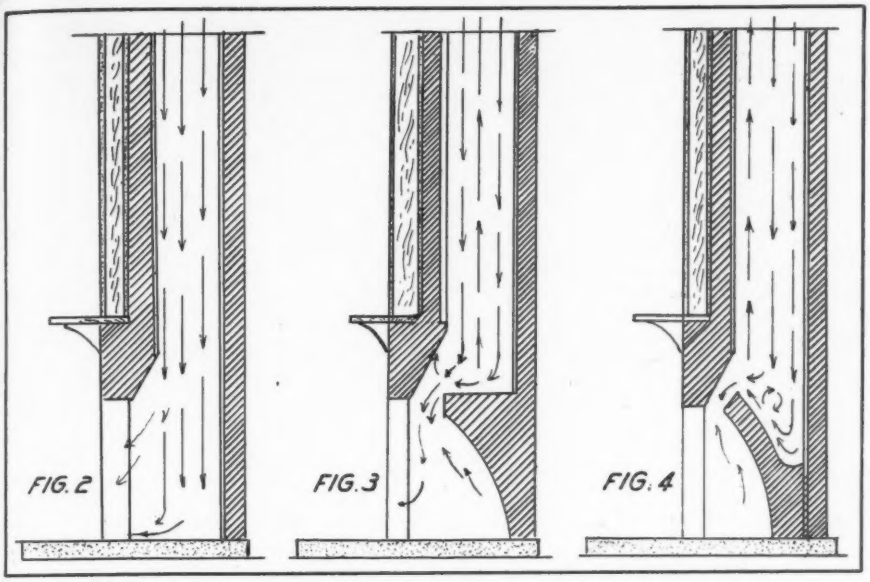
Submitted by Professor L. M. Roehl, Cornell University, Ithaca, New York



Figs. 2, 3, and 4 show common faults in fireplaces. Air currents can easily get into the room carrying with them cold and smoke

ing down the chimney cannot strike the throat, but are deflected off into the pocket at the back. This pocket is very important. If it is too large, air currents will whorl in it, and be thrown out into the room. (See Fig. 4.) If it is only a shelf, worse results will follow, while to eliminate the pocket altogether is pure folly. Figure 2, 3, and 4 show three cross sections of actual fireplaces in the writer's own neighborhood. Figure 2 is worse than nothing, and has but one redeeming feature — it is excellent for Santa Claus. Figure 3 is a common type, which, with a damper installed, can be used. Figure 4 has part of the right ideas, but has too large a pocket, and too narrow a throat, causing a strong whorl on windy nights.

Another feature that must not be overlooked, is that the chimney must extend some 18 to 24 in. above the highest point of the roof. In the sketch of the summer cottage in Figure 5, this point has been observed. Note that the fireplace chimney extends well above the roof so that the tall trees cannot demand their toll in gusts of wind. Many fireplaces are spoiled in this way simply because eddying currents of air can whorl over a roof and down the chimney. A good fireplace adds a touch of charm to a home, but it should by all means be well built.

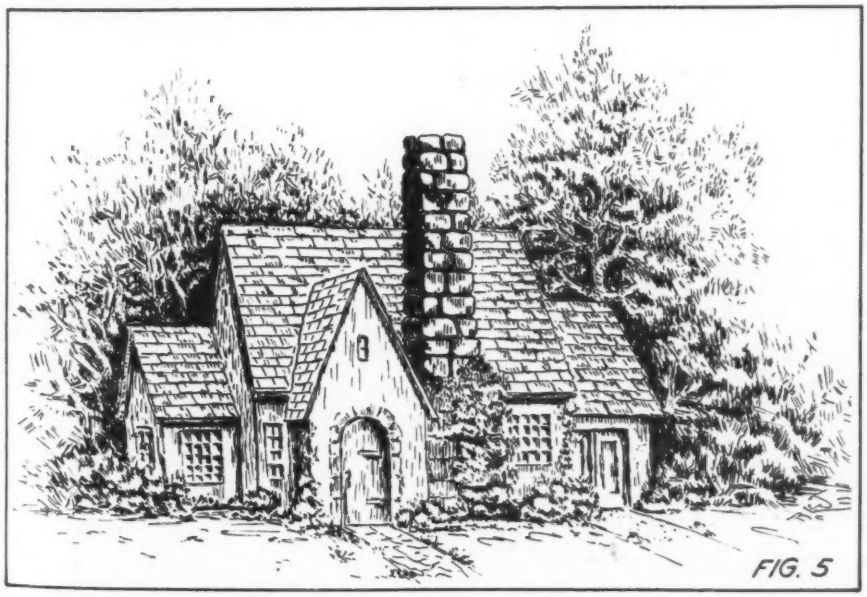


Fig. 5. This sketch of a summer cottage shows a fireplace built from river-bar rock. The chimney adds to the general appearance of the building and is tall enough to guarantee a good draft

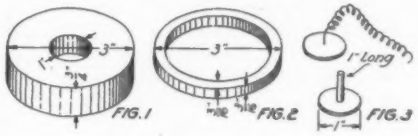
TELEPHONE

C. E. Beck, Intermediate School, Lockport, New York

Transmitter

1. Cut 2 pieces of ¾-in. softwood to size shown in Figure 1, and bore a 1-in. hole ½ in. deep in center.

2. Cut 2 pieces of 3/16-in. plywood to shape and sizes shown in Figure 2. These are fastened to the bases with ½-in. brads.



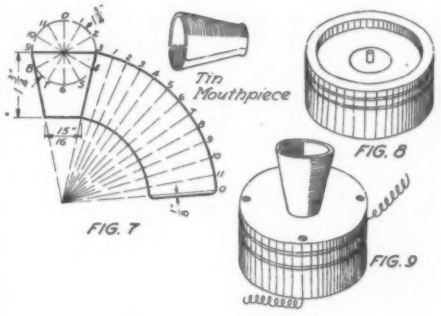
3. Cut the four tin disks shown in Figure 3. Solder a piece of stiff wire to center of two of the disks and a 6-in. piece of bell wire to the center of the other two.

4. Cut 2 disks of thin tin 3 in. in diameter. Punch a small hole in center for stiff wire (See Fig. 4).

5. Cut 2 disks of 3/16-in. plywood and bore 1-in. hole through centers, as shown in Figure 5.

6. Cut 4 pieces of 1/16-in. pasteboard as shown in Figure 6.

7. Make layout for mouthpiece as shown in Figure 7. Form on beakhorn stake and solder ⅛-in. lap seam. Force out end to fit hole in cover.



8. Put disk with flexible wire through hole in bottom of base. Fill space with carbon granules (made from positive post of a dry cell) and lay disk with stiff wire on top. Lay on paper washer (Fig. 6) and then the diaphragm. Push down on wire and solder to diaphragm. Cut off the remaining wire.

9. Lay on washer shown in Figure 2 and then the cover shown in Figure 5. Fasten them to the base with four 1-in. brads. Solder a 6-in. wire to edge of diaphragm. Force in mouthpieces, and put a staple in for hanging up the transmitter. Shellac all over. (See Figs. 8 and 9.)

Receiver

1. Cut the two 3-in. plywood disks and two ½-in. softwood disks shown in Figures 10

and 11. Bore a 1-in. hole through the plywood disk and drill a ⅛-in. hole through the ½-in. stock.

2. Cut out two 3-in. tin diaphragms as shown in Figure 12. Cut out 8 paper washers

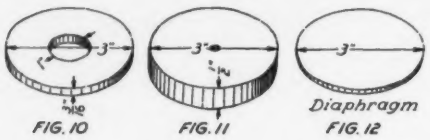
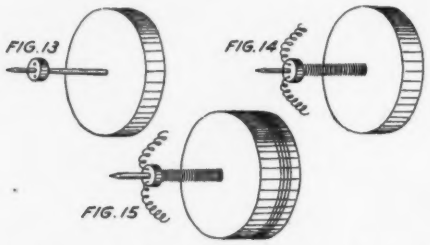


FIG. 10 FIG. 11 FIG. 12

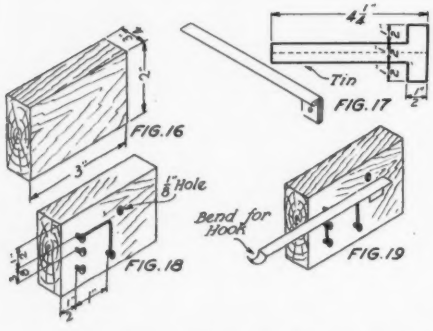
like the one shown in Figure 6. Cut off two pieces of ½-in. dowel, 3/16 in. long. Drill a ⅛-in. hole through the center, and two 1/16-in. holes in each as shown in the assembly in Figure 13.

3. Put a 16d spike through the hole in the disk shown in Figure 11. Then push the dowel onto the spike, leaving 2 in. for the winding



as shown in Figure 13. Insulate the spike between disk and dowel with one layer of newspaper, and shellac thoroughly, letting this dry before beginning to wind the coil.

4. When dry, start winding the coil of No. 24 enameled wire, allowing about 5 in. of the wire to project through the inside hole of the dowel. Wind on 4 even layers, then push the end through the outside hole and leave about 5 in. for making connections. (See Fig. 14.)



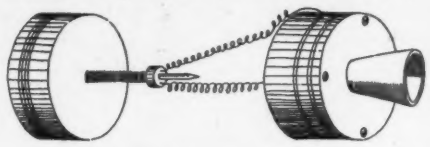
5. Lay 3 paper washers on surface of disk and on top of these place the diaphragm as shown in Figure 15. Lay paper washer on diaphragm, place cover on top of it and fasten the whole with two ¾-in. brads. Solder on 3 ft. of silk-covered lamp cord for making future connections.

Switch

1. Square up stock according to the dimensions shown in Figure 16.

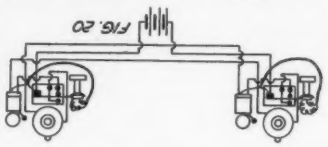
2. Cut out a piece of tin to size shown in Figure 17. Fold on dotted line. Then bend down the end flap. Form the hook on the other end as shown.

3. Put four No. 7 by ¾-in. r.h.b. screws, into the switch block as shown in Figure 18, leaving the heads out ¼ in. Solder wire to



heads, and make connections between the upper and lower screws as shown.

4. Fasten the switch hook in place as shown in Figure 19, with a No. 7 by ¾-in. r.h.b.



screw. Have the hook touch upper screw. Bend the hook at the end as shown.

Hook-Up

Make the connections as shown in Figure 20. By raising the receiver, bell will ring. If no bell is used, the wire to the lower connection on the switch is omitted, and the receiver wire is connected directly to the lead wire.

Personal News

¶ Mr. E. W. Manzer, of the public schools of Bronxville, N. Y., will conduct a course in metalcraft at the summer session in the Pineridge Indian Reservation, Pineridge, S. Dak. It will be the aim of the Office of Indian Affairs, at this summer session, to bring out the handwork of the American Indian. There will be a number of other subjects intended to enrich the life of the Indian. Additional summer schools will be conducted at Gallup, N. Mex., and Wingate, Ariz.

¶ Prof. George C. Decker, a member of the industrial-arts faculty of the State Teachers' College of Buffalo, N. Y., will be a graduate lecturer in industrial-arts education for the summer session at Cornell University, Ithaca, N. Y. Professor Decker received his bachelor's degree from Stout Institute, Menomonie, Wis.; his master's degree from Ohio State University, Columbus, Ohio, where he is a candidate for the doctorate in industrial-arts education. He is an officer in the Stout Alumni Association.

¶ Prof. Everett G. Livingston, of the industrial-arts faculty of the State College, Ames, Iowa, will be a graduate lecturer in industrial-arts education for the summer session at the State College, Pullman, Wash. Professor Livingston received his bachelor's degree in industrial arts from the State Teachers' College, Pittsburg, Kans. His master's degree in industrial-arts education was obtained from the Iowa State College, Ames, Iowa, and he is a candidate for the doctorate in industrial-arts education at Ohio State University.

¶ Mr. W. L. Creasy, instructor in vocational agriculture at the Woodlawn, Va., high school, was recently awarded the title of Master Teacher of Vocational Agriculture of the South for 1936. With the title goes an award of $100, given in recognition of special achievements in his educational activities in the South. Mr. Creasy has been connected with the Woodlawn High School since 1926, when he assumed charge of the agricultural program. He is also an instructor in evening classes for adult farmers in four schools in Carroll County, Virginia. He is the adviser of the Woodlawn Chapter of the Future Farmers of America.

Association News

WESTERN ARTS ASSOCIATION CONVENTION

Toledo, with its rich historic, industrial, commercial, and educational institutions was a mecca for those interested in the arts when it served as host to the Western Arts Association on April 14 to 17, 1937.

The theme chosen for this, the 43rd annual convention of the association, was "Living in the Arts." This was emphasized throughout the various sessions held but especially at the opening session by the keynoter, Bess Foster Mather, the vice-president of the Association. At this session, too, representatives extended to the Western Arts Association greetings of the Eastern Arts Association, the Southeastern Arts Association, the National Association for Art Education, and the International Art Congress.

Dr. Maris M. Profitt, Educational Consultant, also extended the greetings from the U. S. Office of Education, Washington, D. C.

At the Thursday morning meeting, Dr. Edward S. Maclin, President, New River State College, Montgomery, W. Va., presided. Gertrude M. Hadley, Chairman, Department of Art Education, Art Institute of Chicago, spoke at this time on "Teacher Education Curricula in the Arts," and William H. Varnum, Chairman, Department of Art Education, University of Wisconsin, Madison, spoke on "Art Programs for the General College Student." A panel discussion was also held on the subject of the arts in the general college programs, with L. C. Mitchell, Director, School of Painting and Allied Arts, Ohio University, Athens, as discussion leader. Clarence Ward, Professor History and Appreciation of Art, Oberlin College, Oberlin, Ohio, summarized the conclusion arrived at.

At the same time, another group held a panel discussion on the subject of "Teacher Education Programs."

Dr. Fred C. Whitcomb, Director, Division of Practical Arts, Miami University, Oxford, Ohio, was discussion leader at this session. The panel consisted of Lawrence F. Ashley, Chairman, Department of Industrial Arts Education, State Teachers College, Charleston, Ill.; Albert A. Grinnell, Professor of Industrial Arts, Miami University, Oxford, Ohio; Otto A. Hankammer, Professor of Drawing and Design, State Teachers College, Pittsburg, Kans.; John J. Hatch, Chairman, Departments of Fine and Industrial Arts, State Teachers College, Newark, N. J.; Helen Henderson, Professor of Homemaking Education, State University, Bowling Green, Ohio; Edward S. Maclin, President, New River State College, Montgomery, W. Va.; Frank W. Phillips, Superintendent of Schools, DeKalb, Ill.; Orville E. Sink, Chairman, Department of Industrial Arts Education, Ball State Teachers College, Muncie, Ind.; and Edna Noble White, Director, Merrill-Palmer School, Detroit, Mich. Clyde Hissong, Dean, School of Education, State University, Bowling Green, Ohio, summarized the conclusion.

Thursday afternoon was devoted to tours to industrial plants, schools, art museums, and other places of interest.

The annual banquet was held Thursday evening. Frank C. Moore, Supervisor of Industrial Arts, Cleveland, Ohio, and President of the Western Arts Association presided. The main speaker on this occasion was Dr. William H. Johnson, Superintendent of Schools, Chicago, Ill. The subject of his address was "A New Day for the Arts in Chicago." On Friday morning,

(Continued on page 7A)

THE PORTER-CABLE TAKE-ABOUT SANDER IS DOUBLE DUTY EQUIPMENT

School saves $1800

Here is a dollar and cents demonstration of manual training equipment that more than pays its way. The Porter-Cable Take-About Sander is a tool that gives a maximum of value as a training implement and put to work for practical desk finishing and maintenance pays for itself many times over. More than 2500 schools are using this efficient Sander.

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(Continued from page 206)

3-minute presentations of viewpoints held by panel members on the subject of "Arts in Programs of Elementary Education" were held. Among those better known to those interested in industrial-arts work were: Carl Hamberger, Assistant Supervisor of Industrial Arts, Cleveland Public Schools; R. Lee Hornbake, Professor of Industrial Arts, State Teachers College, California, Pa.; John R. Ludington, Professor of Industrial Arts, Ball State Teachers College, Muncie, Ind.; Orpha M. Webster, Professor of Art Education, Miami University, Oxford, Ohio; Dr. Mary G. Waite, Professor of Education in Fine and Industrial Arts, University of Cincinnati.

Friday evening was devoted to an Epsilon Pi Tau banquet, at which Dr. Lawrence F. Ashley, State Teachers College, Charleston, Ill., was toastmaster. At this banquet, laureate awards were presented to Paul E. Harrison, Industrial Arts Department, Northern Illinois State Teachers College, DeKalb, Ill.; John J. Hatch, Departments of Fine and Industrial Arts, State Teachers College, Newark, N. J., and Dr. C. A. Howard, Commissioner of Education, Salem, Ore. The addresses on this occasion were given by Professor John R. Ludington, Ball State Teachers College, Muncie, Ind.; Dr. William E. Warner, Ohio State University, Columbus, Ohio; Dr. Maris M. Profitt, Educational Consultant, U. S. Office of Education, Washington, D. C., and Blake-More Godwin, Director, Toledo Museum of Art, who spoke respectively on "Industrial Arts in the North Central Association," "Examples of Fraternity Sponsorship," "The United States Office of Education Program," and "Fifty Centuries of Glass" (illustrated).

On Saturday morning, community and adult programs were discussed. D. S. Deffenbacher, Regional Advisor, Federal Art Project WPA, Washington, D. C., presided. This was followed by an association planning conference. The association luncheon was held at noon at which Dr. Rudolph L. Lindquist, Director, University School, Ohio State University, Columbus, Ohio, and Dr. Charles H. Lake, Superintendent of Schools, Cleveland, Ohio, gave addresses. In the business session, the following officers for the coming year were elected: Miss Jane Betsy Welling, Associate Professor Art Education, Wayne University, Detroit, president; William H. Varnum, Chairman Department of Art Education, University of Wisconsin, Madison, vice-president. Harry E. Wood, Director Fine and Practical Arts and Vocational Education, Indianapolis, Ind., will again serve as secretary-treasurer. Sylvan A. Yager, Assistant Principal of Laboratory School, Terre Haute, Ind., was elected auditor.

Milwaukee, Wisconsin, was chosen as the place for the 1938 convention to be held April 20–23, 1938.

SPRING MEETING OF CENTRAL CONNECTICUT TEACHERS

The spring meeting of the Central Connecticut Industrial-Arts Teachers was held on March 30, in the Roosevelt High School, New Haven. Fifty members of the association were in attendance. Chairman Andersen introduced Edward Weeks, principal of the school, who welcomed the visitors and described the layout of the classrooms and shops.

Mr. Burl Osburn, Millersville, Pa., the principal speaker, discussed "Industrial Arts of the Future." He spoke of the development of industry from its infancy up to the present complicated and involved state, also of the historical development, and of the creative joy of accomplishment that accompanied the development of our foods, clothing, shelter, utensils, records, and tools. Machines and power have changed the early ways of doing things, and it is no longer a case of lack of supplies but rather a case of knowing where and how to secure them. It is necessary to reconsider the developments of life and see what has been lost while progress has been made.

President Ginns presided at the business meeting. The secretary's report was read and accepted. President McAndrews, of the Connecticut Industrial-Arts Association, spoke of the probability of the next teachers' convention-day program in Bridgeport, and the suggestion was approved by the members. Plans were being completed for the next meeting to be held in Newington, on May 19.

The members voted to add three new names to the nominating committee. The meeting adjourned, to give the members an opportunity to visit the shops of the school. — *Harry Barnicle.*

PENINSULA INDUSTRIAL-EDUCATION CLUB ORGANIZED IN VIRGINIA

Teachers of industrial arts and vocational subjects on the Peninsula of Virginia have organized the Peninsula Industrial-Education Club. A constitution and by-laws have been adopted.

The club was organized as a means of helping teachers of industrial arts and vocational subjects to carry on their work more effectively. Members of the club are affiliated with the American Vocational Association, and with the Virginia Vocational Association.

Mr. Joseph A. Schad, of Newport News, was elected president; Luther W. Machen, Hampton, was named vice-president; and Walter C. Van Buren was elected secretary. — *Walter C. Van Buren.*

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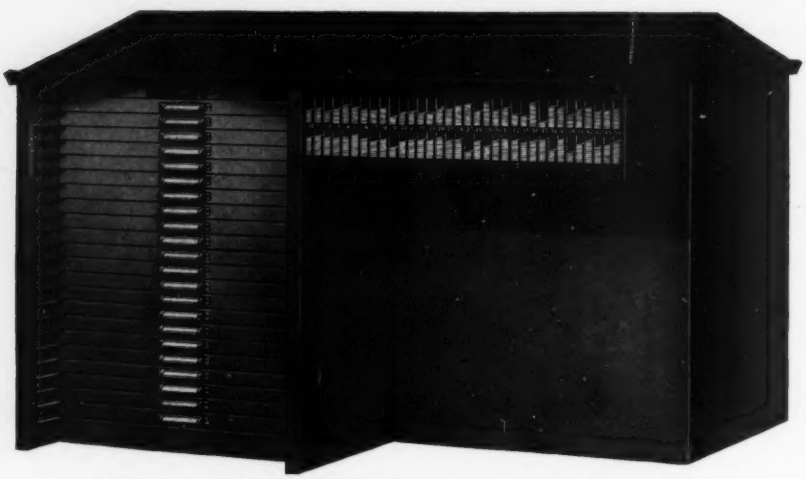

Low price and Hamilton quality construction are combined in this modern, efficient type cabinet. Literature on other cabinets for Junior High Schools and Vocational Classes will be sent on request.

Special Features

1. **Cabinet No. 12013-D has a double tier working bank top. Will accommodate two students on each side, total of four working at the cases at a time.**
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9. **Hamilton quality construction, economical and efficient design.**

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School-Shop Equipment News

NEW SOUTH BEND MOTOR-DRIVE LATHE

The South Bend Lathe Works, South Bend, Ind., has announced a new line of back-geared, screw-cutting, precision lathes in the new underneath-belt motor drive.

This new underneath-belt motor drive is compact, silent, powerful, and economical in operation. The drive and the driving mechanism are fully enclosed in the cabinet leg underneath the lathe headstock, and there are no exposed pulleys, belts, or gears, and no overhead belts or pulleys to obstruct the vision or cast shadows on the work.

The V-belt drive is silent in operation, and provides a smooth, steady pull free from vibration and chatter. Adjustment is made by taking up the belt stretch and by obtaining any desired tension on both the motor belt and the cone-pulley belt. A belt-tension release lever on the front of the cabinet leg permits the easy shifting of the cone-pulley belt.

A number of practical attachments may be obtained for these lathes which thus provide versatility and precision with power and rigidity.

NEW PORTER-CABLE TAKE-ABOUT SANDER

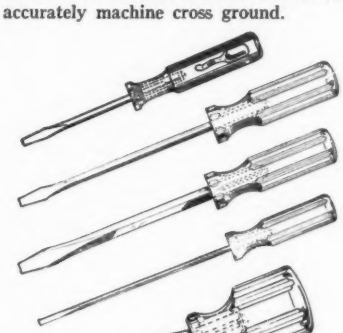
The Porter-Cable Machine Company, Syracuse, N. Y., has placed on the market a new balanced, portable sander, using a 4 by 27-in. abrasive belt.

The new portable sander is designated as the "take-about" sander Type T-4. Its frame is of polished aluminum, with molded bakelite intake, and exhaust air grids. The front and rear pulleys are 4 in. wide and 2¾ in. in diameter. Both rear and front handles are nonmetallic. The motor is installed in a horizontal position, parallel to the sanding shoe, giving the machine a true balance in all directions. The belt has a speed of 1,650 r.p.m.

The sander surfaces new or old wood, removes paint, shellac, varnish, or other finish material. It is useful for light grinding operations, honing down marble and stone, and the edging of glass or other compositions or plastic materials. It will be found useful in school shops where cabinet-making and other forms of woodwork are taught.

NEW VICTOR SCREW DRIVERS

The Stanley Tools, New Britain, Conn., has announced a new line of Victor screw drivers for mechanics and others who prefer composition-handle drivers. The handles are made of a tough cellulose material, which is shockproof, oil and waterproof, and practically break-proof. The blades are made of special tempered steel and are anchored by heavy wings, making it impossible for them to turn in the handles. The driver tips are accurately machine cross ground.



The Victor screw drivers are made in a variety of sizes and styles to meet every requirement of the mechanic. Complete information will be furnished to any school-shop instructor upon request.

NEW X-ACTO DETACHABLE BLADE KNIFE

The Crescent Mfg. Company, Fremont, Ohio, for many years manufacturers of many types of fine blades, has announced the development of a series of twelve styles of blades for the use of artists and craftsmen.

These new blades are a direct development of the fine blades used by surgeons and are

(Continued on page 11A)

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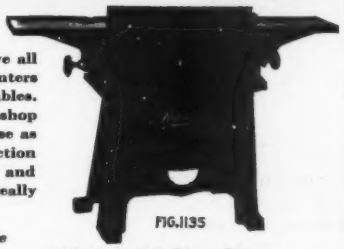

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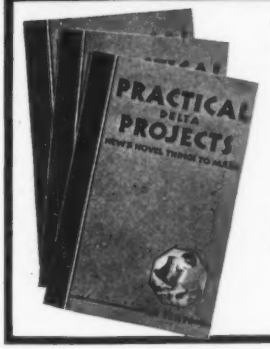

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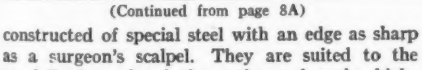
(Continued from page 8A)

constructed of special steel with an edge as sharp as a surgeon's scalpel. They are suited to the specialized work of the artist and make high-grade professional work very simple. The knife has a convenient pen-shaped handle, made of



bakelite material in two sizes. The blades are held absolutely rigid, yet a twist of a setscrew releases the old dull blade and permits the insertion of a new, sharp blade in a few seconds.

The outfit is being marketed under the trade name of X-acto detachable blade knife. Each outfit consists of a handle and six blades and sells at a surprisingly small price. The blades also may be purchased separately.

BRUNING ANNOUNCES LOW-COST PRINTER

The Charles Bruning Company, 102 Reade St., New York, has announced its new Bruning BW printer for exposing black and white prints. It is a simple, compact, continuous printer, scientifically designed, and built for 100 a.c. and 110 d.c. current. It exposes paper of any width up to 42 in., and plugs into any light socket. It consumes much less current than the usual arc lamp machines. After the paper has been exposed in the BW printer, the print may be developed instantaneously in any regular BW developing machine.

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A junior consultation service for out-of-school young men and women from 16 to 25 years is being offered for a limited time in the American Radiator Building adjoining the Board of Education Building in Detroit, Mich. The service operates in close co-operation with the department of guidance and placement of the Detroit schools, and is financed by the National Youth Association. The work is being conducted under the direction of Miss Claire M. Sanders, secretary of the board of control, of the Detroit Committee for Youth Service.

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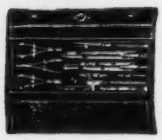

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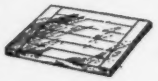

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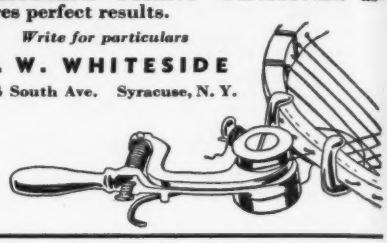

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